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JAMES BRITTEN, K.S.G., F.L.S.

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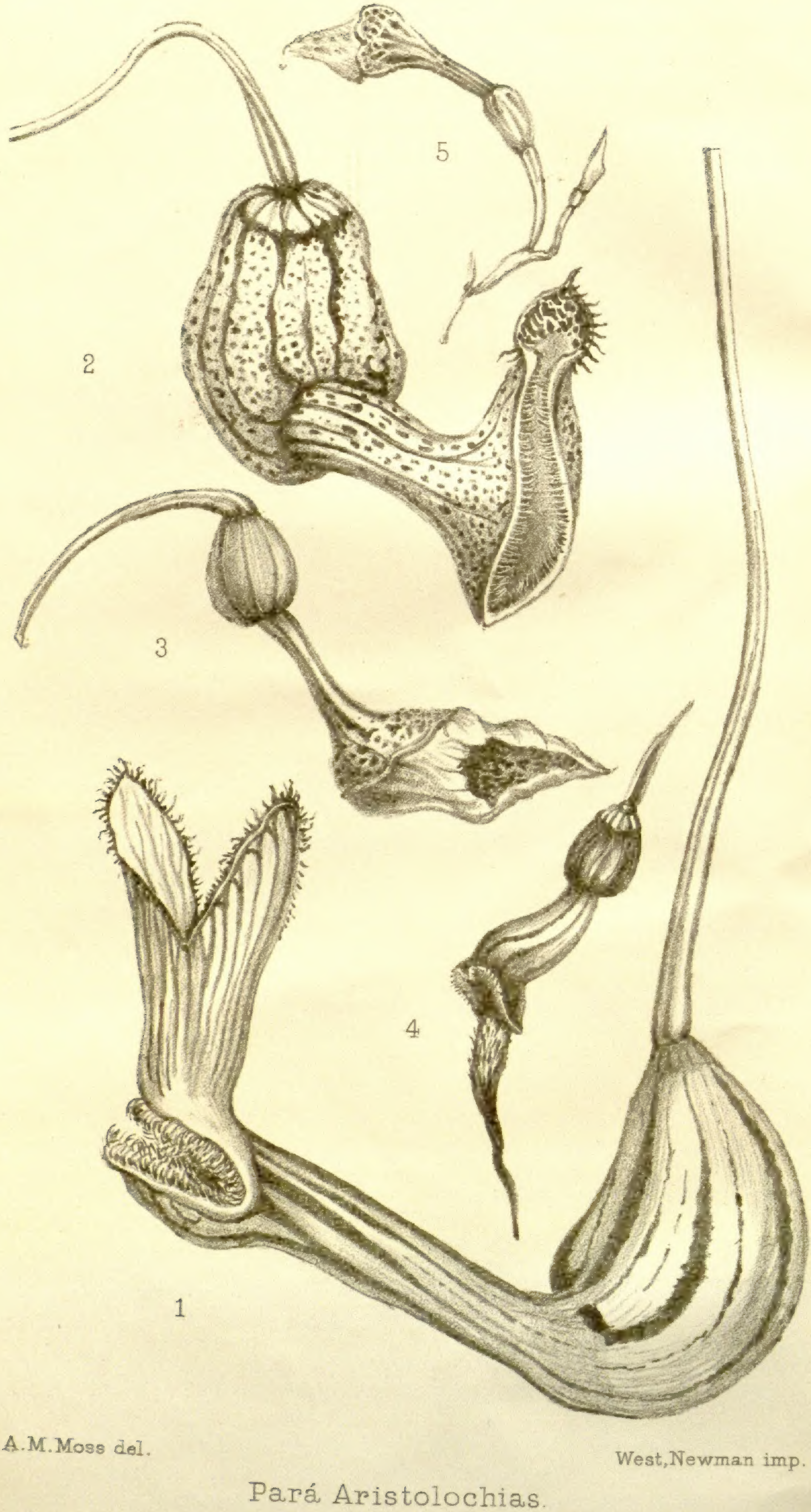

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Pará Aristolochias.

THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

THE ARISTOLOCHIAS OF PARÁ (BRAZIL).

By Rev. A. Miles Moss, M.A., F.Z.S., F.E.S.

With Descriptive Notes by Spencer Le M. Moore.

(Plate 535.)

The remarks which I wish to make upon the Aristolochias of Pará necessitate a short entomological introduction, for it was in my search for caterpillars that I was led to bestow attention upon this particularly interesting genus.

Comparatively little beyond their association with certain kinds of food plants is known of the majority of species of the large lepidopterous genus *Papilio* inhabiting the American continent. One great division of this genus, representing sixty or more species, bears the distinctive title "Aristolochia Swallowtails," for, with certain observed preferences on the part of the butterflies for particular species of *Aristolochia*, it is the leaves, stems and seed capsules of these plants which are employed as the exclusive pabulum of their larvæ. There are at least twelve Aristolochia Papilios in the immediate vicinity of Pará, which, during a sojourn of fourteen months, provided me with a highly interesting field of research in the exploration of their earlier stages. The result of this work awaits publication in the *Novitates Zoologicæ* of the Tring Museum, and in regard to the plants I was careful to press and preserve samples of each species which I encountered for future identification. I could only discover the flowers of seven out of some nine or ten species, so that the identity of the remainder cannot yet be fixed with any certainty.

On my return to England in June, 1913, I presented my dried plants to the Botanical Department of the British Museum. These claimed the immediate attention of Mr. Spencer Moore, who informed me that only three species had been recorded in the *Flora Brasiliensis* for this part of Brazil. His investigation of all the material I have been able to put at his disposal has shown three known species—*A. longecaudata*, *A. Burchellii* and *A. trilobata*, four new species hereinafter described, and two (or possibly three) species, of which leaves only have been found.

All of these species I managed to induce to grow in my small

garden at Pará, where they served as an invaluable adjunct to the study of my *Papilio* larvæ; but I was singularly unsuccessful in getting any of them to grow from seed. Three of them, *A. Huberiana*, *A. Burchellii* and *A. lanceolato-lorata*, were often tried, but with no result.

In regard to their wild growth, the first point to notice is that none of the species are so abundant as to constitute a striking feature at first glance, though the three mentioned above appear to be widespread in distribution, and are fairly common in particular local areas. The bewildering tangle of growth which meets the gaze in a country walk about Pará not unnaturally tends to obscure its less prominent details. It was only after I had learnt to form some rough mental classification among the myriad forms of leaf and stem, and my eyes more readily focussed themselves upon individual objects, that I discovered plenty of *Aristolochia* where before I had thought there was none. On more than one occasion a hovering female *Papilio*, intent upon business, and searching for the precise leaf upon which to deposit an egg, revealed the obscured climber. There were other occasions where the twining stems of *A. Huberiana*, indistinguishable from other creepers, only broke into leaf among the branches of some tree above one's head, and had consequently been passed unnoticed. The common generic characters of *Aristolochia*, however, in contradistinction to other climbing plants, soon became apparent; and not infrequently did the strong pungent odour of the foliage, in the case of those species which possess it to any marked extent (e. g. *longecaudata* and *lanceolato-lorata*, but not *Huberiana*), give a clue to their whereabouts.

As to the precise nature of the locality where the several species of this genus were seen to grow freely it is difficult to generalise. *A. longecaudata* was only found on swampy ground; the large-flowered *A. didyma* seemed to require considerable shade and humidity; *A. Huberiana*, though sometimes overhung, was seen to thrive best in full sunshine, smothering the tree which gave it support, while the remaining species, found sometimes in sandy soil in the open or amongst the *débris* of a forest clearing, seemed to attain their luxuriance in a nice adjustment of light and shade along the many straggling paths which intersect the matto.

This leads me to an important observation, the frequent recurrence of which forced itself upon my attention, but baffled all attempts at explanation. Unless one is to explain away all odd phenomena on the supposition of mere coincidence, the entire *Aristolochia* genus about Pará possesses a marked preference for communistic growth to a degree which suggested intelligent co-operation. It was quite exceptional, in fact, to find any one species growing alone. Provided that the conditions were at all favourable, two, and quite often three, distinct species would be found within ten or twenty paces from each other. Then, though the conditions appeared no less favourable, no more *Aristolochia* of any kind could be found for possibly the next mile. I at first suspected the thoroughness of my investigation,

but diligent and repeated searching to ascertain the range and distribution of each species in the neighbourhood served only to confirm the truth of what I now assert.

The following brief notes in regard to locality, appearance, &c., may be found useful in supplementing Mr. Moore's descriptions.

A. didyma. Found in three distinct localities of the matto, fully two miles from one another, *viz.* Souza and Utinga. Plant by no means prolific but of sturdy growth, stout in stem, with very large leaves. Leaf heart-shaped, delicate in texture, smooth, glaucous green, with fine white bloom on under surface and on stem. The usual pungent odour when crushed. Essentially a climber, easily attaining a length of 20 to 30 ft.

A. longecaudata. A very rank species, only found at Utinga, Rio Guamá, and near the mouth of the Rio Una, growing in mud and water left by the frequent inundations of the river. Stems root freely when covered with earth, and the plant appears to thrive when transferred to a pot of charcoal and sandy soil with a plentiful supply of moisture. Leaves very various in size, shape and thickness at different stages of growth; dark green above, lighter beneath, rather rough but minutely veined, and imparting their strong pungent odour to the surrounding atmosphere. Flower altogether remarkable, most evil-scented, and comparable only to dung. Doubtless attracts special flies to assist fertilization, though this end is sometimes defeated by their becoming finally entrapped. On a comparatively large area of bushes, covered by this thickly growing species, the flowers were particularly scarce, and though several other flowering stalks were discovered and carefully watched after the flowers had fallen, in no case did the seed-pod swell to maturity. When found at their maximum growth these flowers exceeded 14 in. in length. They were bladder-shaped with a hairy lip, a long tapering appendix twisted like a corkscrew, and in colour a semi-translucent cream, freckled and lined with deep maroon. An old plant with proportionately great and coarse leaves must have been fully 30 ft. in length, and was securely intertwined with other creepers in the branches of a tree.

A. Huberiana. Another thickly growing species, but preferring sunshine and only a moderate degree of humidity. Essentially a creeper, though tending to become bushy at times, and ranging to 20 ft. or more when supported by a tree. Leaves bright green, with no apparent scent, of sturdy build and rather rough. Flowers very small and insignificant, and of a greenish hue faintly lined with maroon. Capsules disproportionately large and tightly packed with an abundance of flat seeds, each of which bears the exact representation of a conventional heart with flanged edges. Both flowers and capsules generally very abundant, the latter by their size attracting the eye when hanging free.

Localities.—Curro, Tucanduba, Rio Guamá, Murutucu, S. Joaquim, S. Braz, and near the Bosque, &c., all within five miles of the city. Also near Mosqueiro, twenty miles north of Pará.

A. lanceolato-lorata. A straggling species of slight growth,

though occasionally attaining large leaves and a considerable length of stem. With *A. Burchellii* this species must rank as one of the commonest and most widespread in the district, and it would be futile to attempt to give full localities, though Villa Violeta, Souza and S. Joaquim may be mentioned as strongholds, and it occurs freely twenty miles away, N.E. of Mosqueiro. The leaves are bright green and smooth, the young shoots delicately tinged with red, and the whole plant possesses the strong pungent odour so characteristic of many species of the genus. Flower maroon with yellow centre, of moderate size and comparative abundance. Capsules equally abundant, smooth and somewhat elongate. Seeds thick and heart-shaped, but without the flanged border referred to in *A. Huberiana*. Though sometimes found growing in open and dry places, this plant seems more in its element when twining up the stems of saplings along paths and in the half shade of second-growth forest.

A. Burchellii. In regard to locality, range of distribution, abundance, method of growth, &c., this species is on all fours with the last-named. In other matters, however, it is very distinct. It is essentially a rough climbing plant, the under-surface of the leaves and the stem readily adhering to one's clothes. It goes by the local appellation of "coração de cobra," from a fancied resemblance of the leaf to the heart of a snake. Both leaf and stem are of a bluish green, and are not quite so strongly scented as in the aforementioned species. Flower larger, purple and light green, and fairly common. Capsules and seeds also larger in proportion, and rough like the rest of the plant.

A. trilobata. This species I have only recently found growing wild—in the matto of Marajo island. I met with it on three occasions in gardens in the Ilha das Onças and on the road to Murutucu, and I learnt that it was locally known as 'urubucá,' and was grown, like many other herbs, as a 'remedio.' The tripartite leaf, resembling that of certain Passion flowers, is misleading in appearance, but its scent is unmistakable, and its fairly large bladder-shaped flower of cream and maroon is characteristically that of an *Aristolochia*.

A. Mossii. The entire plant is inclined to be glossy and smooth, without hair and without bloom. Stems and veining of leaves light to dark maroon, giving a distinctive character at once. Leaves dark ochreous green on upper side, lighter beneath, and smooth in texture. Some leaves pointed at apex, but many inclining to a rounded extremity. Leaves and stem possess the usual *Aristolochia* odour in common with such species as *A. lanceolato-lorata* and *longecaudata*. One flower (in gradation of growth) above each leaf on flowering stem. Flower smaller than *didyma*, and bearing only a general resemblance to it on first glance. Upper lip or cap single, pointed, very heavily marked with dark purplish maroon, and with hairy appendages of same colour. The mouth heavily fringed with light ochre-coloured hairs. The flower speedily closes, and thus entraps dipterous flies, &c., which are released on the speedy decay of the flower,

and presumably help to fertilize the next opening flower.* The scent is bad, but is fainter than that of *A. didyma*.

Notes and Descriptions by Spencer Moore.

Of the forty-eight species of *Aristolochia* described in the *Flora Brasiliensis* (vol. iv. 2, pp. 78–114), the Pará province is mentioned as the home of three only, and although considerable additions have been made to the genus as represented in Brazil since Masters's Monograph appeared, our knowledge as concerns the province in question is virtually no further advanced to-day. Thanks to Rev. A. Miles Moss a step forward can now be made.

To be thoroughly satisfactory, *Aristolochia* specimens should show the attachment of the flowers to the stem, and the fruit also should be included, as there is much variety in this respect. Living on the spot, Mr. Moss has enjoyed a rare opportunity and has taken full advantage of it, with the result that his material, often in the case of this genus fragmentary and rarely not leaving something to be desired, fulfils all possible requirements. And besides collecting to such excellent effect, Mr. Moss has also sent clever drawings in water colour of the various species, a most valuable asset to the student of *Aristolochiaceæ*. The list of Pará species is as follows: with the exception of *A. Burchellii* (§ *Peltiflorœ*) all belong to § *Unilabiatæ*.

A. Burchellii Mast. Generally distributed and noted as far as Mosqueiro, twenty miles north of Pará.

Previously known only from San Paulo province.

A. trilobata L. In gardens of Pará and adjacent islands; wild on Marajo island.

A species with a rather wide American distribution.

A. longecaudata Mast. Environs of Pará, Utinga, Rio Guama, and near mouth of Rio Una.

A Guiana species.

Of this Mr. Moss sends a drawing of the capsules, hitherto unknown. They are oblong in shape, about 10 × nearly 2 cm. long, on stalks of their own length, yellow-green in colour and traversed longitudinally by five dark brown ribs. The cordate-reniform, grey-brown, 6 mm. long, seeds are flat and glabrous on the ventral face, on the dorsal bearing a slightly raised brown raphe.

Aristolochia (Unilabiatæ § Ecaudatæ) **lanceolato-lorata,** sp. nov. Caule volubili tenui longitrorsum sulcato glabro, foliis longiuscule petiolatis lanceolatis vel lanceolato-oblongis sub apice cuspidato-attenuatis apice obtusiusculis basi cordatis 5-nervibus nervis præsertim pag. sup. conspicuis supra subnitidis subtus opacis papyraceis utrinsecus glabris, floribus submediocribus graciliter pedicellatis in racemos foliis brevioribus digestis, perianthio basi ventricoso mox subito contracto infra medium

* Specimens of these flies kindly examined by Mr. F. W. Davies, of the Natural History Museum, were pronounced to belong to the genus *Sarcophaga*, but are too much damaged to name specifically.

parum refracto unde pæne adusque fauces aliquanto dilatatos infundibulari faucibus apertis margine revolutis in labium lanceolato-loratam tubum manifeste superantem margine revolutam protractis, columna genitali brevistipitata anguste campanulata superne 6-loba, capsula ovoideo-oblonga glabra a basi dehiscente, seminibus cordato-cuneiformibus facie dorsali fere planis ibique scabriusculis facie ventrali rhaphi prominente indutis.

Hab. Generally as of *A. Burchellii*; *vide supra.*

Folia summum 20 × 8 cm., intervallum basale 15 × 15 mm. margine obscure repanda, in sicco griseo-viridia, juvenilia subtus aliquantulum glauca; costæ laterales 2 exteriores cito dichotomæ; reticulum laxum, satis perspicuum; petioli usque ad 4 cm. long., sæpe vero breviores. Racemi nonnunquam usque ad 13-flori, tandem 5–6 cm. long. sed sæpe breviores; bracteæ ovatæ, 1–2 mm. long. Pedicelli (cum ovario) circa 2 cm. long. Perianthium totum 6·5 cm. long.; basis 7–8 × 5–6 mm.; tubus 17 mm. long., basi 2·5 mm. faucibus 10 mm. lat.; labium 4 cm. long., paullo supra basin 6 mm. lat., superne 1 mm. lat. vel paullulum ultra, apice emarginatum. Columna genitalis 2·5 mm. long., stipite 1 mm. long. suffulta. Antheræ oblongæ, loborum basubus paullulum se inculcantes, 1·75 mm. long.; lobi papillosi, 1·5 mm. long. Ovarium lineare, 6 mm. long. Capsula 23 × 12 mm.; valvulæ oblongæ, fuscæ, quæque linea prominente percursa. Semina 4 mm. long.

The affinity of this is with *A. cornuta* Mast., from which it differs chiefly in the shorter few-flowered racemes, the narrower mouth of the perianth, which is produced into a longer somewhat differently shaped appendix, and the short stipe supporting the genital column.

Aristolochia (Unilabiatæ § Ecaudatæ) **Huberiana,** sp. nov. Caule volubili sat gracili puberulo deinde glabro, foliis petiolatis oblongo-ovatis acutis basi sinu satis lato cordatis 5-nervibus tenuiter coriaceis supra glabris subtus in nervis puberulis demum glabris, racemis axillaribus abbreviatis perpaucifloris ut bracteæ et pedicelli et ovaria subtiliter pubescentibus, perianthii submediocris extus puberuli basi ventricosa quam tubus parum recurvus infundibularis ima basi membrana decurva præditus breviore labio ovato-oblongo subito breviterque acutato, columna genitali breviter stipitata anguste campanulata superne 6-loba, capsula ovoidea glabra valvis prominenter carinatis, seminibus suborbicularibus late marginatis facie dorsali planis necnon scabriusculis faciei ventralis rapha fere subevanida.

Hab. As of *A. Burchellii, q. v.*

Folia modice 9–10 × 4–4·5 cm., tandem 14–18 × 6·5–8 cm., juniora sæpe 5–8 × 2–2·5 cm., pag. inf. pallidiora, utrinque prominenter reticulata; petioli 1–3 cm. long., pubescentes demum glabrescentes. Inflorescentiæ axis circa 2 cm. long. Bracteæ ± 5 mm. long. Perianthium 3 cm. long.; basis ventricosa 6 × 5 mm.; tubus 13 mm. long., basi 2 mm. faucibus 9 mm. lat.; labium 13 mm. long., juxta medium 6 mm. lat. Columna genitalis 3·25 mm. alt., hujus stipes ·75 mm. Antheræ lobos stigmatis ægre attingentes, 1 mm. long.; lobi papillosi, 1 mm.

long. vel paullulum ultra. Pedicellus (cum ovario lineari) 13 mm. long., hoc solum 8·5 mm. Capsula 5 × 3·5 cm. Semina 10 × 8 mm.

Near *A. consimilis* Mast., but the leaves have a narrower basal sinus and are thinner in consistence and less hairy; the perianth is smaller, with the ventricose part of the tubular portion much shorter and narrower, and the limb is smaller and differently shaped.

Aristolochia (UNILABIATÆ § ECAUDATÆ) **Mossii**, sp. nov. Volubilis, glabra, foliis petiolatis ovato-cordatis cordatisve apice rotundatis ipso sæpe brevissime cuspidulatis acutisque 5-nervibus membranaceis supra pallide lucentibus subtus opacis, floribus ex axillis solitatim erumpentibus pedunculis quam folia brevioribus insidentibus, perianthii tubo inferne ventricoso superne refracto infundibularique intus pilis carnosulis sparsim insperso ore lato necnon prominenter ciliato labio brevi suborbiculari margine ciliis carnosulis longis fuscis instructo, columna genitali breviter stipitata subcylindrica 6-loba, antheris anguste oblongis loborum bases superantibus, ovario lineari glabro.

Hab. Environs of Pará, Marco Road, and near S. Joaquim.

Folia pleraque 6–8 × 4·5–7·5 cm., in sicco olivacea, pag. inf. pallidiora; reticulum mediocriter aspectabile; petioli 3–5 cm. long. Pedunculus cum ovario circa 5 cm. long., ovarium solum circa 1·5 cm. Perianthium dilute viridi-flavum, fusco-maculatum-lineatumque; pars ventricosa 3 × 2·5 cm.; labium 10 × 11 mm. Columna staminea (stipite 1·5 mm. long. exempto itaque lobis stigmatosis 2·5 mm.) 4 mm. long. Antheræ vix 5 mm. long.

The short suborbicular ciliate lip is a striking feature of this plant.

Aristolochia (§ BILABIATÆ) **didyma**, sp. nov. Caule volubili sat valido angulato glabro, foliis majusculis nisi magnis longi-petiolatis cordatis vel cordato-suborbicularibus 5-nervibus obtuse acutis papyraceis supra glabris subtus pruinosis, floribus majusculis axillaribus solitariis, pedunculis (cum ovario) longit. flores circiter æquantibus, perianthii tubo dimidio inf. ventricoso dimid. sup. incurvo cylindrico extus glabro omnimodo pilis albis strigosis intus insperso limbi labio sup. abbreviato quadrato-suborbiculari extus glabro intus piloso-villosulo margine ciliato labio inf. comparate elongato ambitu late obovato haud usque medium bilobo lobis ovatis obtusis leviter divergentibus extus glabro intus basin versus piloso-villosulo margine grosse ciliato, columna genitali stipitata campanulata apice 6-loba, antheris elongatis linearibus loborum bases superantibus, ovario lineari ut pedicellus pruinoso, capsula maxime elongata pendula lineari-oblonga apice uncinato-umbonata valvis angustis pruinosis medio carina valde eminente percursis, seminibus parvis ovoideis anguste marginatis facie dorsali fere planis subevanideque scabriusculis facie ventrali rapham prominentem ostendentibus.

Hab. Environs of Pará; Utinga and Souza.

Folia usque ad 20 × 25 cm., minora vero in axilla flore gaudienti ± 10 × 12 cm., in sicco viridia, glandulis minimis

immersis perlucentibus creberrime donata; petioli foliorum majorum 17–25 cm. long., foliorum minorum sæpius 5–10 cm. Pedunculus sub flore ± 6 cm., sub fructu incrassatus, circiter 10 cm. long. Perianthium 8–10 cm. long.; pars ventricosa dilutissime viridia, purpureo-venosa, 3–3·5 × 2–2·5 cm.; pars cylindrica circa 25 × 8 mm., rubro-lineata; labium superius 13 × 18 mm.; labium inferius intus flavus, rubro-lineatus, 4·5 cm. long., deorsum 1·5 cm. lat., sursum fere 4 cm.; lobi 2 × 1·5 cm. Columna staminea 12 mm. long.; stipes 3 mm., antheræ 7·5 mm., lobi stigmatosi 5 mm. long. Capsula 35 cm. long., circa 2 cm. lat. Semina grisea, 4 × 3 mm.

In the flower this is much like *A. eriantha* Mast. and *A. ridicula* N. E. Br., but its perianth is glabrous outside; there is a well-marked upper lip and the lobes of the lower lip are shorter, broader, and much less divergent.

Mr. Moss has been informed that this is a common plant at Rio Grande do Norte, where it is known as "Sapato defuncto." This statement may be correct, or, as is perhaps more probable, it refers to some allied species. The freshly opened flower, Mr. Moss notes, has a distinct but rather faint odour of bad meat.

A plant grown in the Pará Botanical Gardens from seed received from the Rio Acré proves to belong to this species.

Explanation of Plate 535.

1. *Aristolochia didyma* S. Moore. 2. *A. Mossii* S. Moore. 3. *A. Burchellii* Masters. 4. *A. lanceolato-lorata* S. Moore. 5. *A. Huberiana* S. Moore. (All natural size.)

NOTES ON BRITISH PLANTS.

By C. E. Moss.

IV. Brunella laciniata × vulgaris.

Brunella laciniata (L. Sp. Pl. ed. 2, 837 (1763), excl. var. γ) first became known as a British plant in 1906 (see Journ. Bot. xliv. p. 365). It had previously been reported by Mr. H. Weaver as *B. vulgaris* var. *alba* (Journ. Bot. xxv. p. 84, 1887), as his specimen—in Herb. Mus. Brit.—shows. During the intervening years it has been found in several counties in the south of England, *e.g.* Hampshire, Sussex, Somerset, Gloucestershire, Surrey, Berkshire, Cambridgeshire and Hertfordshire. In Cambridgeshire the plant has been found in three localities, one on low-lying calcareous old river gravel, and two on calcareous glacial clay. I am inclined to think the plant is a new-comer, for although closely allied to *B. vulgaris* (L. Sp. Pl. 600 (1753), excl. vars.), it is so easy to distinguish at sight, that it is scarcely to be imagined that it eluded the vigilance of all British field-botanists up to the year 1887. It is not a critical plant in the ordinary sense of the term; and it is by no means inconspicuous. In the two Cambridgeshire stations on glacial clay, the plant occurs in grass-sown fields which were formerly under the plough; and in its Hertfordshire station, it occurs in a portion of a ploughed field which is now fallow

though the other parts of the same field are under cultivation. These facts suggest that the plant has possibly come to this country as an impurity among foreign seeds. Mr. Weaver (*l.c.*) held this opinion regarding the origin of the plant in Gloucestershire.

My chief interest in the plant, however, is concerned with the fact that wherever I have seen it in this country, it has occurred not only with its close ally *B. vulgaris*—an almost ubiquitous plant in southern England—but also with a number of forms intermediate between the two species. I have searched for these intermediates in a very large number of localities, and in very different kinds of habitats where *B. vulgaris* grows alone, but searched in vain. One cannot help suggesting therefore that the intermediates are hybrids of the two species, and that they are in no wise due to any special or peculiar features of the habitats in which they occur.

The hypothesis that the intermediates are hybrids received corroboration last June, when a party of botanists from Cambridge, led by Mr. A. G. Tansley, visited south-eastern France. In some of the localities then visited, *B. laciniata* was abundant, whilst *B. vulgaris* only occurred rarely and locally; but whenever the two species did occur together, the same intermediates were found, though they were entirely absent from the numerous and extensive areas where *B. laciniata* occurred alone. Mr. R. S. Adamson and Mr. A. S. Marsh, both of whom were with the party, and both of whom had seen the intermediate plants in England, were naturally interested in the occurrence of the intermediate plants under these circumstances.

Until, however, the hybrids have been produced artificially, it is best to refer to them as putative hybrids, though I entertain no doubt that, as soon as artificial crossings of the two species are made, the conclusion that the intermediate plants are hybrids will be experimentally demonstrated.

Although the two species are very closely related to each other, it happens that the most definite characters for their separation are such as appeal instantly to the eye. *B. vulgaris* has entire leaves: *B. laciniata* has leaves more or less deeply cut. *B. vulgaris* has usually blue or purple flowers, rarely pink or pure white: *B. laciniata* has constantly cream-coloured flowers. Certain other distinguishing characters (such as the degree of hairiness and the width of the inflorescence) are less convincing, or at least less obvious.

In leaf-cutting the hybrids exhibit every possible gradation from one species to the other.

As regards the colour of the flowers, the matter is complicated by the variability of *B. vulgaris* itself. The flowers of this species, as above stated, are usually blue or purple; but pink flowers are not uncommon, whilst flowers which are pure white also occur. These variations occur in localities where *B. laciniata* has never grown; and if (as indeed some botanists would now have us believe) they are due to hybridism, the cross which caused them must have taken place in glacial or pre-glacial times when

the ancestors of the northern examples of *B. vulgaris* grew side by side with *B. laciniata* before the great migration of plants northwards, which followed the retreating ice. Although it is, in the nature of the case, impossible to disprove this hypothesis,* there can, in my opinion, be no doubt that recent crossings of the two species produce forms with a still greater amount of variability in the colour of the flowers than is ordinarily to be seen in *B. vulgaris*. The putative hybrids—I refer here to those of quite recent origin—have sometimes cream flowers like *B. laciniata*, sometimes blue or purple flowers like *B. vulgaris*, and sometimes pink flowers like the rather uncommon forms of *B. vulgaris*: a few have one or two cream flowers on an inflorescence otherwise composed of blue or purple or pink flowers; and some have one or two blue or purple or pink flowers on an inflorescence which is otherwise wholly cream. White flowers, either in *B. laciniata* or in the hybrid, I have not seen.

Perhaps the most striking of the putative hybrids are those which have blue or purple flowers and strongly laciniate leaves. This form is plentiful at Hardwick, Cambridgeshire. One of these I planted in my garden in 1913; but in 1914 the same root produced only pink flowers and leaves only a little dissected. This reminded one of somewhat similar changes which are known to occur in some garden-hybrids, *e.g.* the colour changes which occur from year to year in Darwin tulips; and here also, the bulbs being perennial, the question of factorial segregation consequent on cross-fertilisation does not arise.

B. laciniata × *vulgaris* does not appear to have been previously recorded as British; but Austrian examples have been distributed by Dr. Stapf, now of the Kew Herbarium, in Fl. Exsicc. Austr.-Hung. no. 1420; and a description of the hybrid, or at least of one form of it, is given by Rouy & Foucaud in their Fl. de France, xi. 276 (1909). In my opinion, however, several of the so-called varieties of *B. laciniata* and *B. vulgaris* should also be referred to this putative hybrid. Mr. J. W. White (Journ. Bot. *loc. cit.*; Fl. Bristol, 478, 1912) recognised the existence of these "varieties," but decided against their hybrid-origin.

The definite recording of a putative hybrid which one here makes gives one the opportunity of appending a few general remarks.

There can be no possible doubt that the occurrence of intermediates of the kind here mentioned between *B. laciniata* and *B. vulgaris* would have been held by most systematic botanists of previous generations to prove that the two species in question were really only one variable and polymorphic species whose characters merged into one another under certain conditions of the habitat; and there would have been no hesitation in making confident guesses regarding the particular habitat conditions which had invoked the intermediate forms. In the hazarding of such speculations no lack either of ingenuity or boldness would

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* *Cf.* Lotsy in Proc. Linn. Soc. pp. 73–89 (1914), and the discussion, pp. 89–98.

have been exhibited. Even to-day, both among botanists who are and among those who are not systematists, one frequently finds a lingering, and sometimes even a very strong, prejudice against the belief in the widespread and frequent occurrence of natural hybrids.

Of course, there are many intermediates which are not hybrids; and some of these may form the subject of future notes. But when, as in the case of *B. laciniata* and *B. vulgaris*, it can be asserted with confidence, first, that the intermediates are absent from localities where either putative parent grows alone, and, secondly, that they are to be found whenever the putative parents actually grow together, it is unreasonable to deny that a strong presumption has been established for the belief that such intermediates are of hybrid-origin.

The position is sometimes maintained that the intermediates should not be regarded as hybrids until the cross has been experimentally made, but I think the above remarks on *B. laciniata* × *vulgaris* should make it clear that, even apart from actual experiments, it is possible from a study of distribution to arrive at a tentative conclusion regarding the hybrid-origin of many intermediates.

The old position that intermediates between two closely allied plants proved that there was only one polymorphic species in question became untenable as soon as botanists began to produce hybrids by careful experiments. Leaving out of account the rough and ready methods of the average horticulturist or gardener, I believe that the first botanist to produce hybrids artificially and to take such precautions that error became quite impossible was Max Wichura. This botanist set to work about 1850 to test what was then the unverified hypothesis that many of the accepted species of *Salix* were really hybrids. Among other hybrids that Max Wichura produced was a hybrid of *Salix caprea* and *S. viminalis*; and he rightly regarded his artificial cross as "the most beautiful confirmation that the doctrine of hybrids among willows could receive" (*cf.* Cambr. Brit. Fl. ii. 62–63, 1913). Since Max Wichura's time, a considerable number of other cases of putative hybrids have been put to the test of experiment; and, whilst it is possible to mention examples of confirmations of the hypothesis of the hybrid-origin of several well-known and widely distributed plants, I can recall no instance of a plant which was strongly suspected by leading systematists of being a hybrid which has been proved not to be so, though, of course, it may well be that such cases have occurred. The argument from prophecy has in science always been regarded as a strong one; and from the point of view of the prediction of hybrids the upholders of the position that natural hybrids are of common occurrence have every reason to feel gratified. As examples of putative hybrids which precise and careful experiments have proved to be actual hybrids, I mention (in addition to *Salix caprea* × *viminalis*), *Geum rivale* × *urbanum*, *Melandrium* (*Lychnis*) *album* × *dioicum*, and *Primula veris* × *vulgaris*. I

purposely give no examples except those where the most elaborate precautions were taken against the admixture of any foreign pollen with that which was artificially employed.

I believe that many people imagine that Gregor Mendel was the first to use such precautions; but that is not so. Max Wichura's experiments were made some sixteen years before the publication of Mendel's results, and some forty years before their rediscovery by his modern disciples. Wichura did nothing in the way of segregating his hybrid-offspring: he had a limited and definite object in view; and this he attained.

One sometimes hears (now that it is known with certainty that hybrids of closely allied plants can often be easily produced, that these often produce seeds which are more or less fertile, that the second generation even of hybrids whose first generation is almost wholly infertile is often almost fully fertile, and that in the ultimate hybrid offspring an almost unlimited number of different forms may easily be produced, some of which differ conspicuously from the original parents) that it is no longer possible for any systematist to know when he is dealing with a hybrid or with a pure species. The Mendelian worker who fixes his mind on a large F_2 family which he himself has reared is naturally very greatly impressed with its almost endless polymorphism; and, in proportion to his lack of field-observations, is his strength of conviction that the systematist in his work on species is groping in the dark, that, in fact, the systematist can in the nature of the case know nothing about the origin of the plants which he investigates.

It must be admitted that the work of the systematist has become more difficult now that the widespread occurrence of hybrids in nature is a fact which has to be admitted; but I hope that the above remarks on *Brunella* will show that it is still possible, even in the total absence of experiments, to discriminate, whenever the distribution of the plants can be studied, between natural hybrids and pure species. In the cases of plants which are commonly cultivated the difficulty of doing so is indeed very great; but even in such cases, I believe that the ascertaining of the actual state of affairs is not in all cases altogether hopeless. To state that the work of the systematist has, in consequence of the appearance of undoubted difficulties, come to an end, is to allow opinions to outrun the actual facts of the case.

Because *Brunella laciniata* and *B. vulgaris* probably hybridize in nature, has it to be accepted that it is no longer possible to gather pure-bred *B. vulgaris* in a Yorkshire meadow? Or, to take cases where the intermediates have been produced artificially, can it be maintained that it is now impossible to collect pure-bred *Geum urbanum* in a dry hedgerow in Cambridgeshire, or a pure-bred *Melandrium* (*Lychnis*) *dioicum* in a Scottish glen, or a pure-bred *Primula vulgaris* in a Hampshire wood? The mere asking of such questions is surely their sufficient answer to all botanists who take a broad view of the facts.

How it comes about that species, in spite of the occurrence of

hybrids and in spite of the almost unlimited number of variations of their offspring, manage to hold their own in nature is a problem which has not yet been studied. Pending the solution of that interesting matter, it would be well if systematists and Mendelians recognised that they have more to learn from each other than partisans on each side are at present disposed to admit.

ZEXMENIA COSTARICENSIS Benth.

By S. F. Blake, A.M.

This Central American composite was first described by Linnæus in the *Hortus Cliffortianus* (p. 399 (1737)) as "Bidens foliis ovatis serratis, petiolatis caule fruticoso," with the habitat "America." No collector's name was given, but the species was based on a specimen (now in the British Museum) sent to Linnæus by Philip Miller which had been grown at Chelsea Garden from seed collected by Robert Millar in 1736 in Central America: Miller, redescribing it, gives the locality as "Carthagena," by which eighteenth century collectors understood what is now called Cartago, not Carthagena in Columbia. On this specimen and reference was based the name *Bidens fruticosa* L. in 1753. In the second edition of the *Species Plantarum* the specific name was transferred to *Verbesina*, and to the original citation from the *Hortus Cliffortianus* was added a second from Plumier,* "Bidens frutescens, ilicis folio, flore luteo." Plumier's plate and description apply to an entirely different plant, much more closely allied to true *Bidens*, namely, *Narvalina domingensis* Cass.† In 1768 Philip Miller redescribed *B. fruticosa* from other specimens grown from seed collected by Robert Millar, calling it *B. frutescens*, and quoting the same synonym from the *Hortus Cliffortianus* as had Linnæus, but not mentioning *B. fruticosa* L. Whether Miller wrote *B. frutescens* by mistake for *B. fruticosa* it is now impossible to say. Miller also retains *Verbesina fruticosa* L. in the precise sense of Linnæus, and with identical synonyms, thus referring the same citation from the *Hortus Cliffortianus* to species supposedly of two different genera.

The two names, *Bidens fruticosa* L. (*Verbesina fruticosa* L. p. p.) and *B. frutescens* Mill., thus created on almost identically the same material, have since been referred to three different genera, but never to the proper one. In the *Prodromus* (v. 493 (1836)) *B. frutescens* is referred to *Salmea scandens* (L.) DC., but *B. fruticosa* L. is not mentioned, although a new *B. fruticosa* DC. is described; in the *Index Kewensis B. frutescens* is referred to *Salmea grandiceps* Cass., which in turn is synonymized with *S. eupatoria* (Spreng.) DC. (both = *S. scandens* (L.) DC.), and

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* Plum. Cat. 10 (1703); Pl. Amer. (edit. Burm.) 42, t. 52 (1756).

† *Needhamia domingensis* Cass. Dict. Sci. Nat. xxxiv. 336 (1825), not *Needhamia* R. Br. (1810); *Narvalina* Cass. *l.c.* xxxviii. 17 (1825); ***Narvalina domingensis* Cass. ex DC. Prod. v. 633 (1836).**

B. fruticosa L. is referred to *Wulffia stenoglossa* (Cass.) DC. (= *W. baccata* (L. fil.) Ktze.). In 1907 Urban (Sym. Antill. v. 265) transferred *Verbesina fruticosa* L. to *Narvalina* as *N. fruticosa*, displacing *N. domingensis* Cass., and in 1911 O. E. Schulz definitely referred *Bidens fruticosus* L. (*sic*) to *N. fruticosa* (L.) Urban.

Meanwhile, the true plant of Linnæus and Miller had been described by Bentham from Oersted's Costa Rican collection as *Zexmenia costaricensis* Benth., transposed into *Z. nicaraguensis* by C. Mueller a few years later; and in 1877 a more pubescent form of the species was published as *Z. villosa* Polakowsky.

The existence of a valid *Zexmenia fruticosa* Rose (1891) prevents the transfer of the oldest name of the plant under discussion (*Bidens fruticosa* L.) to its proper genus. Nor can *Bidens frutescens* Mill. be taken up, being "still-born," since, as a *Bidens*, the species already bore the valid name *B. fruticosa* L. Consequently *Zexmenia costaricensis* Benth. must continue to be used for this species. It may be noted in passing that *Narvalina fruticosa* (L.) Urban must fall, leaving *N. domingensis* Cass. the valid designation of that species, since *Verbesina fruticosa* L. of the second edition of the *Species* was based primarily on *Bidens fruticosa* L. of the first, to which, in the interval, a synonym belonging to another genus had been mistakenly referred. The synonymy of the two forms of *Zexmenia costaricensis* will then stand as follows:—

ZEXMENIA COSTARICENSIS Benth. Vidensk. Meddel. 95 (1852)!

Bidens fruticosa L. Sp. ii. 833 (1753)!, not *Z. fruticosa* Rose, Contr. U.S. Nat. Herb. i. 103 (1891).

Verbesina fruticosa L. Sp. ed. 2, ii. 1271 (1763), in part (excl. syn. Plum. which = *Narvalina domingensis* Cass.).

Bidens frutescens Mill. Gardn. Dict. ed. 8, no. 4 (1768)! (still-born name).

Zexmenia nicaraguensis "Benth." ex C. Muell. in Walp. Ann. v. 226 (1858) (sphalm.).

Narvalina fruticosa (L.) Urban, Symb. Antill. v. 265 (1907), as to name-bringing synonym only, in part; O. E. Schulz, in Urban, *l.c.* vii. 144 (1911), as to name-bringing synonym.

Stem glabrous or glabrate; leaves usually rather sparsely tuberculate above, lepidote in age, usually nearly glabrous beneath; peduncles hispidulous, often densely so, the hairs appressed or ascending.

Z. COSTARICENSIS Benth. var. VILLOSA (Polak.) Blake.

Z. villosa Polak. Linn. xli. 579 (1877)!

Stem pilose-tomentose with rusty hairs; leaves strigillose-scabrous above, more or less hispid-pilose beneath, particularly along the veins; peduncles shortly spreading-pilose with whitish hairs; otherwise as in the species, toward which it varies. COSTA RICA: San José, Nov. 28, 1875, *Polakowsky* 466 (cotype of *Z. villosa*: Br. Mus.); Cartago, alt. 1417 m., Nov. 1894, *Brolley* (*Pittier* 8991: Br. Mus.).

TROPICAL AMERICAN RUBIACEÆ.—VI.*

By H. F. Wernham, D.Sc., F.L.S.
(Department of Botany, British Museum.)

(Continued from Journ. Bot. 1914, p. 316.)

Note on Tournefortiopsis.

This genus was established by Rusby in his "Enumeration" of Bolivian plants, collected by Bang (Part iv. 1907, p. 369). The type of the genus, described therein, is *T. reticulata*; and, save for the opposite leaves and prominent interpetiolar stipules, this plant bears a near resemblance to a *Tournefortia*; I have found a specimen placed among the unnamed members of the last-named genus in more than one herbarium.

In this Journal for 1913 (p. 218) I have described a second species, *T. minor*. Now, in the course of a recent examination of the genus *Tournefortia* in the National Herbarium, I have discovered a very distinct third species of the Rubiaceous genus in question, whhich I now proceed to describe:—

Tournefortiopsis major Wernham. Ramulis subcompresso-teretibus sublanato-hirsutis indumento plus minus deciduo; *foliis* tenuiter coriaceis late ovatis ± 22 cm. × 11 cm., breviter leniterque acuminatis, basi subrotundatis petiolo 5–10 cm. longo compresso sparsiter hic inde basin versus densius ferrugineo-tomentoso, supra glaberrimis rugosulis subtus in venis dense hispidulo-villosis inter venis minute lanato-pubescentibus, venis secundariis utrinque 12–14; *stipulis* deciduis. *Floribus* in generis modo secunde in cymis furcatis alaribus dispositis, pedunculo 3–4 cm. longo ut brachi alateralia ± 5 cm. longa indumento densiusculo ferrugineo hispidulo-pubescente induto; *calyce* parvo irregulariter dentato in fructu vix accrescente. *Bacca* subangulata appresse lanato-strigosa 5-loculari.

The locality is, unfortunately, doubtful; the specimen was collected in Peru or Brazil by Poeppig, n. 1300! Hb. Mus. Brit.

The species is readily distinguishable from the other two by the size and shape of the leaves and by the long petioles.

I append a key to the three species now to be recognized:—

Petioles as much as 9 cm. or more. Leaves broadly ovate, over 10 cm. wide	*major*
Petioles rarely as much as 3 cm. Leaves oblong-lanceolate, not 5 cm. wide.	
Calyx-limb sub-entire, inconspicuous in fruit . .	*minor*
Calyx-limb distinctly lobed, conspicuous in fruit, often nearly as long as the berry	*reticulata*

(To be continued.)

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* I propose to change the title of my papers named hitherto "New Rubiaceæ from Tropical America" to the one at the head of this sixth instalment. My motive for this change is to cover cases where reference is made to features of interest in species already described, or where more general matter concerning this family is dealt with; a course which I contemplate in the near future.

MISCELLANEA BRYOLOGICA.—IV.

By H. N. Dixon, M.A., F.L.S.

(Continued from Journ. Bot. 1914, p. 124.)

Some Australasian Species of Breutelia.

Brotherus in his treatment of *Breutelia* in the *Musci*, pp. 653–660, separates certain species under "*Eubreutelia*" Broth. from the Section *Acoleos* (C. M. as Section of *Bartramia*) by the form and position of the leaf-base. In *Acoleos* this is "Ovaler bis eilanzettlicher, nicht angedrückter," while in *Eubreutelia* it is "Angedrückter bis umfassender, meist oben erweiteren, zuweilen quadratischer Basis." Apart from this and the "weniger kräftige" habit of *Acoleos* as against "mehr oder minder kräftige" plants of *Eubreutelia*, there are no separating characters. This character drawn from the leaf-base is no doubt a well-marked and useful one in the case of some of the more robust species, where the lamina is more or less abruptly reflexed from the erect or somewhat amplexicaul base, which is often distinctly wider above—at the shoulder—than at the insertion; a condition accentuated if the leaf is flattened out, when the basal part becomes deeply plicate, and the margin at shoulders folded in. But its value has, I think, been overestimated in the group of species of which *Breutelia pendula* Hook. may be taken as the type; as has also the character derived from the position of the capsule. The plants to which I refer are *B. pendula* (Hook. Musc. Exot. t. 21), *B. comosa* Mitt., *B. divaricata* Mitt., *B. consimilis* H. f. & W.; to which may be added *B. Sieberi* (Hornsch.). Of these *B. pendula* and *B. Sieberi* are placed by Brotherus in *Acoleos*, the others in *Eubreutelia*.

Mitten described his *B. comosa* (*cf.* Fl. Tasm. ii. 195) as differing "from all states of *B. pendula* in the short erect base of its leaves, which is widest at the point from which the superior portion is deflexed, and composed of cells which are everywhere far shorter"; and also in the capsule suberect or inclined, as against the pendulous capsule of *B. pendula*. The sentence referring to the cells must, I think, be a slip of Mitten's, and the character at once dismissed; for nothing could well be shorter than the cells in the type specimen of *B. pendula*, where the upper are often quadrate, and rarely longer than 2×1, while in the type specimen itself of Mitten's *B. comosa* the cells are actually very much longer throughout the leaf. In fact, it might well be supposed that the sentence was a *lapsus calami*, and that Mitten intended the exact opposite of what he wrote, but for the fact that other specimens determined by Mitten as *B. comosa* (*e.g.* "Waitangi R., Bay of Islands, N.Z." in Herb. Kew.) have the cells short, exactly as in the type of *B. pendula*.

As regards the leaf-base, there is no doubt that Mitten's type of *B. comosa*, which is a tall, robust, very tomentose plant, does show a leaf-base more or less markedly of the *Eubreutelia*

character, though less strongly marked than in other species of the Section. But other specimens determined by Mitten himself show an intermediate type of base, *e.g.* the Waitangi River plant referred to above, as also a plant in Herb. Hook., "Allan Cunningham, No. 96, N.Z., 1834," first named *B. pendula*, then determined by Mitten as *B. comosa*; while a specimen "*B. comosa*, N.Z., Knight," in Herb. Mitten, has the leaf-base of *Acoleos* pure and simple. Moreover, specimens of *B. pendula* in Herb. Hook., notably the Campbell Island specimens of Hooker's Antarctic Expedition, show considerable variation in degree of robustness, the more slender forms agreeing with the type of *B. pendula*, the more robust agreeing in habit and leaf-base exactly with Mitten's *B. comosa* from Waitangi River, New Zealand, cited above.

I conclude, therefore, that the form of leaf-base in this group of species is eminently variable, depending much on the degree of robustness of the plant; the more slender forms, such as Menzies' type of *B. pendula*, showing the extreme *Acoleos* form, from which a complete set of gradations can be traced, culminating in the robust tomentose form with fairly well-marked "*Eubreutelia*" base of Mitten's type of *comosa*. If therefore *B. comosa* is to be retained as a species, it must be on the ground of the type of base and robust habit being correlated with the only other character given by Mitten, *viz.* the capsule being suberect or horizontal instead of being pendulous as in *B. pendula*. The specimens in Herb. Kew., however, and others that I have received through the kindness of Mrs. Britton from Mitten's herbarium and others, show that this character is absolutely unreliable. Thus robust specimens with a clearly marked *Eubreutelia* base, sent me by Dr. Cockayne, have distinctly pendulous capsules, and the same is the case with "*B. comosa*, Kelly's Range, New Zealand, T. W. N. Beckett, No. 1030" at Kew; but the most convincing examples are several in which capsules in both positions occur in the same tuft; this is markedly the case with "*B. comosa*, Otira R., T. W. N. Beckett, 1030 B" at Kew, where among numerous capsules, all deoperculate and ripe, most are pendulous, several horizontal, and a few suberect. "*B. pendula*, V. D. Land, No. 2282" in Herb. Hooker, as also "V. D. Land, Laurence and Gunn, No. 2283," equally show both positions of capsule in the same specimen.

I have therefore no hesitation in concluding that *B. pendula* Hook. is a highly variable plant in size, branching, degree of tomentosity, form and size of leaves, and position and size of capsule; standing on the border line between *Acoleos* and *Eubreutelia*, it must be held to include *B. comosa* Mitt., which in view of the ambiguous specimens referred to above cannot even be clearly characterized as a variety. In view, indeed, of its better development, the *comosa* form would properly be considered the type form, while Menzies' plant (the type of *B. pendula* Hook.) represents a smaller, less developed form.

Brotherus implies a doubt as to whether *B. pendula* occurs on Kerguelen Island—"nach Mitten auch auf den Insel Ker-

guelen." I have a specimen ex herb. Mitt., so labelled, "*B. pendula*, near Vulcan Cove, Kerguelen, *Eaton*, 6. 1. 75," which has the capsule suberect, and is robust, as in *B. comosa*, with the stem leaves showing the *Eubreutelia* base (though the branch leaves are purely of the *Acoleos* type). In Hooker's herbarium there are a considerable number of specimens from Kerguelen Island under *B. pendula*, of varying size and habit, some at least with pendulous capsules. Whether or no, therefore, *B. comosa* be united with *B. pendula*, the latter may be safely, I think, attributed to Kerguelen Island.

Turning to *B. divaricata* Mitt. According to the author this "resembles the larger states of *B. pendula*, but differs in its divaricated leaves, which have, when dry, a subflaccid appearance, a differently formed base, and the stems almost simple." The simple or branched character can hardly be taken seriously. *B. pendula* exhibits all varieties of ramification at different times. The same tuft will often produce almost simple stems together with stems showing whorled branches. As to the position of the leaves, I confess I do not understand how the term "divaricate" implies any different position from that usual in *B. pendula*. The description of the leaf-base only implies that it is of the *Eubreutelia* type. Mitten's specimens appear to me to show simply a somewhat lax, and at the same time robust, form of *B. pendula*. The *Handbook of the New Zealand Flora* adds to the description a note:—"Scarcely different from *B. comosa* and *pendula*." This view I should quite endorse. The type of *B. divaricata* might indeed quite well be the type of *B. comosa*, in all obvious characters!

B. consimilis (H. f. & W.) must also be placed under *B. pendula*. The type ("*Hypnum consimile* H. f. & W., Lord Auckland's I., W. 85," in herb. Wilson and Hook.) is a robust plant described by Wilson as like a slender form of *B. elongata*, with almost simple, not very tomentose stems, with here and there a branch, or two or three together, but irregular, and not whorled. The leaf structure agrees with ordinary forms of *B. pendula*, especially of the "*comosa*" type. I have precisely similar forms from New Zealand, notably a fruiting plant from the Mt. Cook district, collected by J. C. Andersen and sent me by Dr. Cockayne. Since writing the above notes on *B. pendula* I have found that Hampe has placed Hooker's Campbell Island *B. pendula* (referred to above) under *B. consimilis*, in his herbarium—which suggests the very close relationship between the two. And he goes on to place another plant of Hooker's from Hermite Island also under *B. consimilis*. This sheet must, I imagine, have given Hampe some qualms, since it comprises both simple stems and stems with whorled branches, while obviously pertaining to the same plant. That a plant which the author (Hooker) considered as identical with his *B. pendula* should be referred by Hampe to *B. consimilis*, while another of his specimens shows forms intermediate between the two in the only distinctive character of *B. consimilis*, viz. the branching, is in itself a testimony to the slight value of that

species. In the *Flora Antarctica*, *B. consimilis* is compared only with *B. elongata* (the robust Australasian "*comosa*" forms of *B. pendula* were not then known), and no characters are suggested that are in any way in conflict with the view that is identical with *B. pendula*.

The seta in the various forms of *B. pendula* varies greatly in length, from 1·5 cm. to 5 cm., but I do not find this character correlated with any others, not even varying according to the general size and robustness of the plant. The variability of *B. pendula* was noted by Mitten, who writes (in Journ. Linn. Soc. (Bot.), iv. 83): "*B. pendula*, which has been much misunderstood, varies greatly in its size, being sometimes not larger than the usual states of *Philonotis fontana*, as in the original specimens gathered by Menzies, at others as large as *B. gigantea*." He adds that *B. elongata* may be a form of *B. pendula*, but I should scarcely be prepared to follow him as far as that.

I should then give the synonymy of *B. pendula* as follows:—

Breutelia pendula (Hook.) Mitt. in Journ. Linn. Soc. (Bot.) iv. 82 (1859).*

Syn.—*Bartramia pendula* Hook. Musc. exot. t. 21 (1818–20).
Bryum pendulum Brid. Mant. M. 120 (1819).
Mnium pendulum Sm. in Trans. Linn. Soc. vii. 262.
Philonotis pendula Brid. Bryol. Univ. ii. 27.
Bartramia comosa Mitt. ex Hook., Handb. of N.Z. Fl. 449.
Hypnum consimile H. f. & W., Fl. Antarct. i. 137.
Bartramia consimilis Mitt. ex Hook., Handb. of N.Z. Fl. 449.
Breutelia consimilis Jaeg. Adumbr. ii. 559.
Breutelia divaricata Mitt. in Journ. Linn. Soc. (Bot.) iv. 82 (1859).
Bartramia divaricata Mitt. in Fl. Tasman. 195.
Bartramia gigantea H. f. & W., N.Z. Fl. ii. 90 (nec *B. gigantea* Schwaegr.).

Breutelia Sieberi (Hornsch.) Mitt. is a well-defined species in the narrower, less plicate leaves, with the base little expanded, not erect and appressed, the upper margins more sharply serrate, the upper cells all elongate; and especially in the scarcely differentiated alar cells. In *B. pendula* these are strongly marked, forming a band two or three rows wide of lax hyaline cells, extending for some distance up the basal margin, and strongly contrasted with the very narrow golden cells forming the rest of the base. In *B. Sieberi* these lax cells are entirely wanting, and the alar marginal cells differ very little from those of the rest of the leaf base, rarely forming a short band of widened, but not large or hyaline, cells. The capsule in the fruiting specimens I have seen is small, quite pendulous, and remarkably mnioid in appearance.

Brotherus expresses a doubt as to the occurrence of *B. Sieberi* in New Zealand. It is certainly very rare there; but I

* Paris is wrong in citing Jaeg. Adumbr. for this combination.

have a sterile plant from Ngauruhoe Volcano, New Zealand, 3–400 ft., sent me by Mr. Ingham, and collected by the late Mr. Jas. Murray, which must, I think, without doubt, be referred there. The alar cells are in a few leaves slightly more developed than in other *B. Sieberi* I have seen, but for the most part are quite typical, while in all other characters the plant agrees exactly. It is quite probable that one or more of the fourteen species described by R. Brown (ter.) in Trans. N.Z. Inst. xxxii. may belong here; but I have not at present had an opportunity of examining them. All the New Zealand specimens determined by Mitten as *B. Sieberi* in Herb. Hook. at Kew are without question *B. pendula*.

Breutelia fusco-aurea Broth., in vegetative characters and leaf-structure, appears to agree exactly with forms of *B. Sieberi* (which, like *B. pendula*, is a variable plant). The fruit, however, is described as suberect, on a considerably shorter seta. In view of the indeterminate position of the capsule in *B. pendula*, I should not be unprepared to find that the same variability existed in *B. Sieberi*, in which case I should incline to unite *B. fusco-aurea* with this species.

Two South African Species of Microthamnium.*

Paris (Ind. ed. ii.) has the following :—

Microthamnium cygnicollum (Hpe.) C. M. in Hedwig. 1899, p. 144.
Chryso-Hypnum cygnicollum Hpe. in Bot. Zeit. 1870.
Eurhynchium cavifolium Rehm. M. Afr. austr. n. 368; Paris Ind. p. 441 (1895).

This entry contains more than one error. In the first place, *Chryso-hypnum cygnicollum* was not published by Hampe, *op. cit.* The name is a herbarium one only. Secondly, *Eurhynchium cavifolium* Rehm. M. Afr. austr. n. 368 is not identical with Hampe's *C. cygnicollum*.

Some time back Mr. Horace A. Wager sent me a moss gathered by him in Natal, which led to my examining these two plants. Mr. Wager's moss proved to be identical with Rehmann's *E. cavifolium*, but on comparing Hampe's specimen of *C. cygnicollum*, quite marked differences appeared. The latter has a rostellate lid, which in *E. cavifolium* is longly rostrate, almost or quite equalling the capsule in length; and the cell-walls are in *E. cavifolium* highly prominent at back of leaf, while in Hampe's plant they are very sparsely and indistinctly papillose, so as to be practically smooth; and there are other differences.

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* Cardot, in Rev. Bryol. 1913, p. 20, has given reasons for rejecting both *Microthamnium* Mitt. and *Stereohypnum* Hampe, adopting the name of *Mittenothamnium* Hennings; and has given a long list of new combinations based on this conclusion. Since then, however, Fleischer (in *Nova Guinea*, vol. xii. Botanique Livr. 2, p. 125) has pointed out that *Rhizohypnum* Hampe has priority over both these names, and is in accordance with the Rules of Nomenclature. In view of the uncertainty of the case, and the possible exception to be made in the list of "Nomina conservanda," now unhappily suspended, I have temporarily used the commonly accepted generic name.

As neither species appears to have been properly published, and both seem to be distinct from any of the published South African species, I give descriptions of them here.

Microthamnium cavifolium (Rehm.) Dixon, sp. nov.—Sordide viride, haud nitens. Caulis vagans, irregulariter pinnatus, ramis subæqualibus, brevibus, gracilibus, *subcompressis*. Folia patentia *concavia*, late cordato-ovata, *acuta vel plusminus longe, sæpe flexuose acuminata*, toto ambitu denticulata. Areolatio brevissime linearis, parietibus firmis crassiusculis, angulis superioribus dorso *valde prominentibus*, unde folia *dense scaberula*. Folia perichætialia interna erecto-appressa, in acumen latiusculum strictum (siccitate solum paullo flexuosum) subdenticulatum angustata. Seta circa 1·5 cm. alta, validiuscula, *rubra*, infra collum sat abrupte arcuata, unde theca horizontalis vel subpendula; theca turgide ovalis, majuscula, brevicollis, *gibbosa*, omnino eurhynchoidea, operculo *rostrato subæquilongo*. Calyptra *lævis*.

Hab. Inanda, Natal; Rehm. M. Afr. austr. n. 368. In umbrosis montis, Inanda; leg. *Wood*, Rehmann, n. 654. In monte Lechlaba supra Houtbush, Transvaal; Rehm. n. 654 b.; n. 655 (forma *tenella*). In monte Kivatlamba, Transvaal, leg. *Maclea*; Rehm. n. 655 b. On stones in bed of stream, 2–3000 ft., Pieter Maritzburg, Natal, 1909; leg. *H. A. Wager*.

M. patens (Hampe) Jaeg. differs *inter alia* in the pilose calyptra; *M. pseudo-reptans* (C. M.) Jaeg. has the branches scarcely flattened, leaves much narrowed, the papillæ very sparse and indistinct, &c. *M. squarrulosum* (C. M.) Jaeg. *e descr.* seems to be very near in vegetative characters, but the fruiting characters do not at all agree—"ped. perbrevi, flavo; operculo conico-acuminato recto," &c.

M. lutescens Mitt. MS. in herb., type ex herb. Mitten, Inanda, Natal, leg. *Wood*, sterile, is certainly this species, and may very likely be Rehmann's n. 654 cited above.

MICROTHAMNIUM CYGNICOLLUM (Hampe) C. M. in Hedw. 1899, p. 144 (nomen).

Syn. *Chryso-hypnum cygnicollum* Hampe MS. in herb.

M. cavifolio affine; differt foliis chlorophyllosis, opacis, *parum concavis*, multo angustioribus, strictioribus, magis gradatim in acumen *breviusculum substrictum haud flexuosum* attenuatis; folia ramea *angustiora*, ovato-lanceolata, cellulis minute *indistincte scaberulis*. Theca minuscula, in pedunculo sub collo aliquando cygneo vel torquato, *subsymmetrica*, nec gibbosa, operculo *brevirostellato*.

Hab. C. B. S., Kooksbosch, leg. *Breutel*; in saxis prope Umpumulo, Natal, Africæ meridionalis, Jan. 3, 1867, leg. *Rev. Borgen*, nos. 5, 5*.

Type in herb. Hampe.

M. pseudo-reptans (C. M.) differs from this species in the inclined, not pendulous, subarcuate capsule, as well as in other characters. In the type of foliation *M. cygnicollum* and *M.*

pseudo-reptans are much alike, and differ markedly from *M. cavifolium* and other allied species referred to above.

NECKERA HOEHNELII C. M. AND N. HOEHNELIANA C. M.

C. Müller, in *Flora*, 1890, in describing the mosses of four Kilimandjaro expeditions, describes (on p. 489) *Neckera* (*Calyptothecium*) *Hoehnelii* C. M. On the next page (490) he describes another and quite different plant under the name of *N.* (*Rhystophyllum*) *Hoehneliana* C. M. Paris in the Index, ed. ii., has confused these two plants, omitting the latter altogether, and giving in its place the former, which, however, is not a true *Neckera*, but a *Calyptothecium* (*sensu* Paris) or *Renauldia*, according to Brotherus's arrangement in the *Musci*.

N. Hoehneliana C. M. is a good species of *Neckera* of the section *Cryptopodia*, which appears to be common in the mountain districts of Central East Africa, frequently fruiting, and need not detain us. Paris omits this altogether.

The position of *N.* (*Calyptothecium*) *Hoehnelii* C. M. (*op. cit.* p. 489) is more difficult. Brotherus, writing in Engler und Prantl, *Pflanzenfam.*, *Musci*, ii. 792 (1906), under *Renauldia*, gives "*R. Hoehnelii* (C. Müll. als *Neckera*), in Aberdare Gebirge, von welcher Art *R. africana* (Mitt. als *Calyptothecium*) in Sudafrika und Usambara wahrscheinlich nicht specifisch verschieden ist." In Engl. Bot. Jahrb. 1894, p. 198, he had described Mitten's hitherto unpublished species as *Calyptothecium africanum* (Rehm.) Mitt., citing Rehmann's no. 332 alone from S. Africa, and also giving four or five localities in Usambara. He makes no reference whatever here to *Neckera Hoehnelii* C. M. More recently, in his report on the Deutscher Zentral-Afrika-Expedition, 1907–1908, p. 159, he gives both species as collected in precisely the same locality, "Rugege-Wald: An Bäum-stämmen ca. 1900 m. ü M.," which appears to imply that he has modified his opinion on this point since the publication of the *Musci* (*loc. cit.*)

A specimen sent me from the British Museum by Mr. W. R. Sherrin, collected on Mt. Elgon, Brit. E. Africa, in Sept. 1909, necessitated a comparison of these plants, and I was led to the conclusion that the two were certainly identical. There is a considerable difference in habit between the form of *R. africana* figured by Brotherus (*Musci*, *l. c.* fig. 593), which agrees with Rehm. M. Afr. austr. n. 332 (in sylvis Knysnæ), and is short, robust, densely branched and rigid, as compared with the Mt. Elgon plant, which has long, pendulous, flexuose stems; but the difference ceases there. The leaf structure, fruiting and peristome characters of the Mt. Elgon plant agree exactly with the S. African plant as figured by Brotherus; and, moreover, Rehm. n. 619 (Transvaalia in mont. supra Lydenburg) quite agrees with the Mt. Elgon plant in habit. The Central African plant, like that of S. Africa, varies considerably in habit, and the male plant is notably a much more slender plant than the fruiting one. If it should be, as seems probable, this difference of habit alone which led Brotherus to keep the two distinct, I have no hesitation in forming the opinion that it is an immaterial one.

I have the plant also from Solia, Mt. Kenya, leg. Kemp, 1911, *st.*; Aberdare Mts., leg. Kemp, 1910, *c. fr.*; and Knysna, Cape Colony, leg. Hewitt, 1910, comm. W. Ingham.

Assuming the identity of the two plants, a rather troublesome problem in nomenclature is solved, as C. Müller's specific name must supersede the synonymy of the S. African plant. Paris gives *Calyptothecium africanum* Mitt. in Journ. of the Linn. Soc. 1886, p. 312, with, as synonym, *Trachyloma africanum* Rehm. M. Afr. austr. n. 332. Both, however, of these are invalid names, no descriptions in either case being published until Brotherus described it in 1894.

Adopting the views above expressed, the synonymy will stand thus :—

RENAULDIA HOEHNELII (C. M.) Broth., Musci ii. 792 (1906).

Syn. *Neckera Hoehnelii* C. M. in Fl., 1890, p. 489.

Trachyloma africanum Rehm. M. Afr. austr. n. 332 (nomen).

Calyptothecium africanum Mitt. in Journ. Linn. Soc. (Bot.) 1886, p. 312 (nomen); Brotherus in Engl. Bot. Jahrb. 1894, p. 198.

Renauldia africana Broth., Musci, *loc. cit.*

THE BRITISH ASSOCIATION IN AUSTRALIA.

By Dr. A. B. RENDLE, F.R.S.

IT may be worth while to put on record some account of the doings of the botanists who attended the meeting of the Association in August of last year. The meeting must have been of great interest to all, and some at any rate will look back to it as the most helpful and richest in experience of any period of their botanical lives.

Members of the advance party spent a week in Western Australia, but the majority had to be satisfied with glimpses of the vegetation seen from the train between Fremantle and Perth and during a drive through the King's Park, an extensive national reserve in a picturesque situation overlooking the Swan River. The remarkable "grass-tree," *Kingia*, was much in evidence, also the cycad *Macrozamia* and species of *Banksia*, the grey-green of the eucalyptus was varied with the brighter wattles which were yellow with flower, and the heath-like habit was very striking in the undergrowth, among which *Boronia* was conspicuous; we were evidently in a dry country. The voyage across King George's Sound on the way to Adelaide recalled Robert Brown's early explorations at Oyster Bay and other localities. On entering the Outer Harbour for Adelaide a wonderful accumulation of the débris of *Posidonia australis* was noticed. The detached leaves were piled in a bank 5 or 6 ft. high, and great balls of fibres from a few inches to several feet in diameter strewed the foreshore. These were generally shaped like a Rugby football, not spherical as are the similar but much smaller balls of *P. oceanica*

which one finds on the Riviera. There were also numerous specimens of the green alga *Codium tomentosum*, the largest about the size of a golf ball.

It was pleasant at Adelaide to find oneself the guest of Dr. R. S. Rogers, a keen student of the South Australian flora and a specialist in the Orchids, of which he has a beautifully prepared collection. Adelaide is a garden city, with roads broad and tree-planted; *Melia Azedarach*, locally known as white cedar, is largely used for this purpose. Round the city are "park-lands," and on the outskirts beyond the suburbs are fruit plantations, including almond, the pink and white blossoms of which were in full flower in early August, olives, oranges, and loquats. Beyond rise the Mount Lofty Ranges, the slopes clothed with sclerophyllous woodland and cut by gullies and deep valleys with precipitous sides. The trees of the woodland are mainly *Eucalyptus*, different in species as the soil varies; with these the bright yellow of the acacias, now in full flower, forms a pleasing contrast. The dense bushy growth between the trees shows considerable variety, and includes *Leptospermum* (Myrtaceæ), *Banksia*, *Hakea*, *Dodonæa*, *Ixodia* (a shrubby composite), and various Leguminosæ. The last-named is specially characteristic of the lower shrubby growth, including *Daviesia*, *Dillwynia*, *Platylobium*, *Pultenæa*, &c., and a remarkably pretty climber, *Kennedya monophylla*. Another climber is *Correa*, the pretty tubular yellow-orange flowers of which do not at first sight suggest its family, Rutaceæ. Other low-growing plants are *Tetratheca* (Tremandraceæ) the so-called Australian heath, *Hibbertia* (Dilleniaceæ), *Epacris impressa* with spikes of pink, crimson or white flowers, and *Acrotriche fasciculiflora*, which produces masses of flowers above the root on the old wood, giving place later to succulent fruits; *Grevillea* and *Isopogon* represent Proteaceæ. Adaptation to xerophytic conditions is well-marked; the narrow stiff type of leaf often ending in a spine is very common, and when broader, as in *Banksia*, *Platylobium*, and others, the leaves are still tough and leathery. Under the guidance of Prof. Osborn, recently appointed Professor of Botany at Adelaide University, an indefatigable and enthusiastic guide, we explored some typical gullies—a veritable botanical paradise. The steep sides are dotted with Black-boy (*Xanthorrhœa*), one species of which, *X. quadrangulata*, has a stem 6 ft. or more in height, the lance-like flowering spikes projecting from the centre of the head of leaves were just showing flower, a streak of whitish blossom appearing on the sunny side facing north. In the damp soil at the bottom of the gully are ferns, species of *Adiantum*, *Lomaria*, *Lindsæa*, and, though now nearly exterminated here, the coral-fern (*Gleichenia*), also small terrestrial orchids, such as species of *Pterostylis* and *Caladenia*, and the remarkable little *Corysanthes*; *Ranunculus lappaceus* and species of *Viola* have a familiar look, but seem out of place. A species of *Leptospermum* (*L. scoparium*), known as tea-tree, forms dense thickets. The sundews are also conspicuous, especially *Drosera Whittakeri* with a rosette of radical leaves and an attractive white flower. *D. auriculata* and

D. Menziesii have elongated stems, which become attached to surrounding herbs by means of the leaf-tentacles, an interesting secondary adaptation, the plant becoming a feeble climber.

Among the small trees on the higher ground should be mentioned the conifer *Callitris quadrivalvis* and the native "cherry," *Exocarpus cupressiformis* (Santalaceæ), the latter with cypress-like habit, and bearing a small cherry-stone-like nut on a berry-like swollen stalk. As Dr. Margaret Benson has shown, it is semi-parasitic, deriving food by means of its root-suckers from roots of other plants.

A large area at Belair on the slopes of the Mt. Lofty range has been set apart as a national reserve; here, among other interesting plants, it was a pleasure to find a little patch of *Phylloglossum.*

A long day-trip across Mt. Torrens to the Murray river illustrated the great diversity of the vegetation under different conditions of stratigraphy. Following the valley of the Torrens river, fine specimens of red gum—*Eucalyptus rostrata*—were seen on the hills near Blumberg; and on entering the Pre-Cambrian formation we passed beautiful park-land with red and blue (*E. leucoxylon*) gums. After crossing Mt. Torrens the country becomes more open, and granite ranges are traversed with bold outcrops in the form of great blocks and boulders, bare of trees except for a few scattered Casuarinas. As we descend, a fine view is obtained of the Murray Flats (Recent to Pliocene), which, formerly covered with dense mallee-scrub and *Callitris* shrubs, is now mostly cleared for wheat-growing. Mallee-scrub covers large areas in South Australia; it is a habit of growth characteristic of several species of *Eucalyptus*. A stout, gnarled, woody root-stock projecting from the ground bears several slender stems which form a bush-growth. *Bursaria spinosa* (Pittosporaceæ) was also a common shrub, and on the dry sandy soil were small plants of a blue-flowered *Erodium* (*E. cygnorum*) and a tiny white composite, *Brachycome*, and a small *Galium* (*G. geminifolium*). Across the Murray, here a fine broad river, are salt-flats, the sparse vegetation of which includes *Salicornia arbuscula* and *S. australis*, *Suæda fruticosa*, *Cotula coronopifolia*, and a remarkable leafless *Muehlenbeckia* (Polygonaceæ), forming large bushes; floating in the water-pools was *Azolla.*

The Botanical Gardens at Adelaide are small but prettily laid out; they contain some fine palms. A striking sight to the northerner was the rank growth of the Arum-lily, *Richardia*, in full flower round the ornamental water.

At Melbourne began the meetings of the Botanical Section. Several papers were of local or specially Australian interest. Mr. C. S. Sutton described the plant-formations of the environs of Melbourne—an area of low or moderate elevation, the vegetation of which has been considerably influenced by man and his domestic animals; and Prof. Ewart and Miss O. Davies gave an account of work of botanical exploration in the Northern Territory. Mr. W. P. Hiern, who was celebrating his jubilee as a

member of the Association, contributed a valuable paper on Australian Ebenaceæ. The family is represented in Australia by eighteen species (eleven of which are endemic) out of a total of 486. The species are limited to the Northern Territory, Queensland, and New South Wales, and belong to the genus *Maba* (ten species) and *Diospyros* (six species, including one recently described *), with *Royena villosa*, a South African shrub which has been recorded from the Brisbane river, and *Euclea australiensis*, known only from a specimen at the British Museum collected in 1831–38 by Sir T. L. Mitchell,† probably in extra-tropical Queensland. Mr. Hiern's paper includes the results of a number of original investigations on the anatomy of the leaves. Dr. Emily Berridge discussed the affinities of *Casuarina*, which she regards as allied to the Fagaceæ, and brought forward evidence from an examination of the structure of the inflorescence, flower, and cupule of the Fagaceæ in support of Hallier's view that the ancestors of Cupuliferæ were allied to the Rosaceæ, and that this series is not a primitive one directly descended from the Gymnosperms.

The President of the Section, Prof. F. O. Bower, drawing from the results of his exhaustive work on the Pteridophytes, gave a paper on modern derivatives of the Matonioid Ferns.

Other papers were of more general interest. Dr. C. J. Bond described some abnormal Begonia flowers, and showed that in certain forms the presence of an abnormal bract frequently indicates an associated abnormality of the sex-organs in the flower which terminates the pedicel on which the abnormal floral bract appears. This abnormality takes various forms, from simple multiplication or modification of accessory floral parts to complete hemaphroditism. The relative position of the male and female sex-organs on the axis indicates whether the flower is primarily male or female. From his observations Dr. Bond concludes that the monœcious condition in plants is probably an intermediate and unstable stage. The hermaphrodite flower, which is probably an adaptation to insect fertilization, has been brought about by delaying the segregation of the male and female sex-organs till the period of the development of the flower. If this occurs early during the evolution of the inflorescence, such plants would revert to the monœcious condition. Prof. Gunnar Andersson discussed the climate in Northern Temperate and Arctic Zones during the latest Pleistocene Age, and Dr. Ostenfeld based on the somewhat remarkable distribution of the "Sea-grasses," or marine genera of Monocotyledons, a theory as to former distribution of land and water in the southern hemisphere. Miss E. N. Thomas and A. J. Davey gave a preliminary account of some features of interest determined in the course of an investigation of the anatomy and morphology of the seedlings of geophytic Dicotyledons, including some pseudo-monocotyledonous forms such as *Ranunculus Ficaria*, *Conopodium denudatum*, and *Cyclamen persicum*.

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* See Hiern in Journ. Bot. 1914, p. 338. † *Op. cit.* 1910, p. 159.

Miss Lorrain Smith discussed the relationship of fungus and alga in the lichen-thallus, and gave a *résumé* of the various views which have been held as to the nature of the different tissues, and as to the origin of the gonidia. Miss E. R. Saunders gave an interesting account of the history of the double Stock, which seems to have made its appearance about the middle of the sixteenth century. Mendelian methods of analysis have shown the relation of the double to the single form, from the seed of which it is obtainable in constant proportions. Physiology was represented by Prof. Ewart's paper on plant oxidases—a class of substances of great importance in plant metabolism, the exact chemical nature of which is quite uncertain.

A joint meeting of the Botany and Zoology Sections was occupied by a debate on the Origin of Species. Professor Bateson in his address as President of the Association had discussed the origin of variation from the point of view of his experimental work on heredity; he dismissed the idea of any permanent effect of the conditions of environment, and suggested that new forms arose from forms already existing by loss of characters. In opening the debate, the writer pointed out that such a view of the origin of species associates with the increasing complexity of structure and function which characterises evolution, a progressive simplicity in ultimate constitution, and that the highest phase of evolution would correspond with the total disappearance of all characters. Further, such a view presupposes an inconceivable complexity of characters in the primitive organisms. The writer also criticised De Vries's theory of the origin of species by mutation. On this theory species have not arisen gradually as the result of selection operating for a long period, but discontinuously by sudden small changes or "mutations," which are given off in new directions and are inherited. Mutations are to be distinguished from fluctuating or individual variability in which the variations are merely of a plus or minus character and are not inherited. The mutation gives rise to a new inheritable specific character, and is the source of the so-called elementary species. But a comparison of these elementary species (*e.g.* Jordan's *Drabas*) shows that their distinguishing features are precisely those which characterise fluctuating variability, namely, relative size and degree of development of parts, hairiness, time of flowering, &c.; each species represents the resultant of a number of slight individual variations of already existing characters, and suggests some process of selection of these rather than a sudden mutation. A similar remark applies to the cases of seasonable dimorphism in alpine meadows described by Wettstein.

Sports or mutations arising under cultivation are of a different kind, being generally marked by some one striking character, such as cutting of the leaf, monophylly in species with compound leaves, &c. Generally speaking, such would not persist in Nature, especially where the floral organs were affected, as marked changes in these would be detrimental. These afford no evidence as to the origin of species in Nature.

Reference was also made to the view recently developed by Dr. Lotsy that crossing is the source of new species. Presumed stable genotypes or elementary species give rise when crossed to unstable heterozygotes which segregate into a new series of genotypes. But it was urged, there is no suggestion that the new batch of species is more in accord with environment than are the parents, and there seems no reason for their persistence. In place of slight variations of well-adapted organisms this theory suggests for the operations of Natural Selection an indiscriminate series of new forms. Is there evidence for the occurrence of these hybrids or of these series of aberrant and largely monstrous forms in Nature in sufficient quantity to account for the origin of new species? It was impossible, the opener thought, to reject the direct action of the environment as a factor in the origin of species.

A number of eminent botanists and zoologists took part in the debate which followed. Prof. Bateson reaffirmed his position, which was adversely criticised by various speakers, including Professors Dendy, Minchin, and Poulton, Dr. J. T. Cunningham, and the Chairman (Prof. Bower).

Prof. Bower's presidential address, delivered in Sydney, gave a review of botanical exploration and work in Australia, with special reference to that of Banks, Robert Brown, Sir Joseph Hooker, Baron von Mueller, and Bentham, and also touched upon the problem of the Antarctic flora generally. In pointing out the great amount of work which still remains to be done in the flora of British possessions, the speaker severely criticised the short-sighted policy which, in several instances, has led to the replacement of a botanist by an agriculturist. It was, he maintained, to the best interest of any State that can possibly afford to do so, to encourage a central establishment for the pursuit of the pure science of botany, even though results of immediate practical use do not appear to be flowing from it at any given moment. In such matters it is impossible to forecast what will and what will not be eventually of practical use; and in any case, as educacational centres, the purely botanical establishments will retain their important function of supplying that exact instruction without which none can pursue with full effect a calling in the applied branches.

Prof. Bower then referred to the Australian Pteridophyta, in which he himself was specially interested. Three of the four divisions of this great group are represented in the Australian flora, and in each case by plants which show peculiar and probably, for the most part, archaic characters. *Phylloglossum*, which is peculiar to the Australasian region, is remarkable for its annual storage tuber, or protocorm, the primitive significance of which has in Prof. Bower's opinion been exaggerated. As regards *Tmesipteris* and *Psilotum*, he agreed with Prof. A. P. Thomas as to their affinity with the now extinct Sphenophyllales rather than with the Lycopods, with which they were ranked by the earlier botanists.

Passing to the Filicales, the President called attention to the considerable number of the relatively ancient eusporangiate forms present in the Australasian flora, and referred to recent work on their embryology and anatomy. These relatively archaic forms have a direct bearing upon the phylesis of ferns; and conclusions as to phyletic sequence must be based on the consideration of as many characters as possible. A great obstacle to such work is the prevalence of parallel development in phyla which are believed to have been of distinct origin. This has led to the inclusion in one and the same genus of forms which have certain characters in common, but for which more careful study indicates a separate origin. Passing to the Angiosperms, the speaker emphasized the enormous difficulties with which the student of phylogeny is faced in dealing with a group which shows, on the one hand, the far-reaching results of parallel development, and on the other the effects of great plasticity at the present day or in relatively recent times. He deprecated the method of those workers who started from preconceptions based upon limited palæontological data rather than from an intensive study of the living plants themselves.

In conclusion, the President stated his belief that the prevalence of parallelism and convergence is a strong argument in favour of the action of the environment in the genesis of inheritable characters. He pointed out that the constitution of the higher plants and the higher animals is radically different in many points, and especially in the fact that in plants the generative cells are not segregated early from the somatic; arguments from the one kingdom to the other are dangerous in the extreme.

Mr. J. H. Maiden and Mr. R. H. Cambage contributed papers dealing with the structure and evolution of the genus *Eucalyptus*. The genus has existed in Australia since late Eocene or early Miocene times, before the development of the present mountain system, and when the climate was mild to warm. Various types, differing in form and arrangement of leaf, venation, bark characters and nature of the essential oil, have been developed with changes in environment, which were partly climatic and partly affecting soil conditions. Mr. Fred Turner gave the results of his botanical work in north-east New South Wales, which has a semi-tropical flora, very dense and luxuriant in places. A paper of Mendelian interest on Primulas was communicated by Mr. R. P. Gregory.

During the stay in Melbourne Prof. Ewart, who acted as local botanical secretary, conducted an excursion to Emerald, thirty miles up country in the hills. The latter half of the journey was by means of a little mountain railway, winding in and out of the mountain ranges and allowing fine views of fern- and forest-clad valleys and mountain slopes. We were too early for many of the flowers, but saw some fine trees of *Eucalyptus*, the tall pillar-like trunks rising unbranched for a great part of their height; one known as the messmate (*E. obliqua*) reaches a height of 150 ft.; others were the stringy-bark (*E. macrorrhynca*), the grey gum (*E. goniocalyx*), and the narrow-leaved peppermint (*E. amygdalina*).

Often the trunks stand bare and blackened by the forest fires, but it is remarkable to note the persistent vitality shown by some cases of recovery after a fire, the charred stems bearing a whiskered growth of green shoots. Another myrtaceous species, *Leptospermum scoparium*, was instanced in this connection; the fruits remain fresh and succulent on the branches for many years (it was said, sometimes as many as seventeen), the seeds being released only as the result of a forest fire. Along the valleys some fine tree-ferns were seen, the common tree-fern, *Dicksonia antarctica* and *Alsophila australis*, which may attain a height of 30 ft. or more, also *Cyathea*. The lower parts of the gullies were rich in the smaller ferns. The upland country when cleared of the bush is excellent for fruit growing. Mr. Nobelius's famous nursery at Emerald is two hundred acres in extent, and on it two-and-a-half million trees are raised annually. By the kindness of Dr. McArthur, of Melbourne, a few of us were able to spend a week-end on the hills and to botanize unrestricted in the virgin bush.

The Melbourne Botanic Gardens occupy a considerable area, just outside the city, on the Yarra. The position is pleasantly undulating, and there is a fine piece of water; the collection of Australian plants is of special interest. In the Gardens is the National Herbarium, in which is the important Australian herbarium of Baron von Mueller. It is under the charge of Prof. Ewart, who combines the functions of Government Botanist and Professor of Botany in the University, the home of which is two miles or more away at the other end of the city. Prof. Ewart, who was known as a worker in botanical physiology before leaving England, has done useful work on the Australian flora, both from a systematic and an economic point of view. But under existing arrangements, and with the limited assistance at his disposal, he is unable to carry on effectively the systematic work initiated by von Mueller.

Sydney is fortunate in having a Professor of Botany, Mr. A. A. Lawson, a pupil of Prof. Bower, in addition to the Director of the Botanical Gardens, the veteran Australian botanist Mr. J. H. Maiden. The fine Gardens are delightfully situated on sloping ground round a bay of Sydney Harbour, and are flanked on either side by a park-like area, the Domain. There is a very interesting collection of plants, despite the poor sandy soil, including a strong tropical element. Among the various figs is a fine specimen of *Ficus indica*; also of the Moreton Bay fig (*F. macrophylla*), which grows well in Sydney, and is widely planted; it is, however, a greedy tree. Also a good collection of Cycads, some well-grown Dragon-trees, and a fine Norfolk Island Pine (*Araucaria excelsa*) more than a hundred years old; the last-named is not native, but is often planted in Australia.

It is interesting to note the widespread use of the so-called Buffalo Grass (*Stenotaphrum americanum*), which seems the universal lawn-grass in Australia. It has a coarse growth, and the effect does not compare with our own lawns, which, however, would not stand the dry climate of Australia.

From Sydney the botanists made an excursion full of interest to the Blue Mountains, running parallel with and about fifty miles from the coast; a range which for many years proved an insurmountable barrier to the early colonists. The eastern face forms a series of abrupt canyons, which may reach 2000 ft. in depth, the gorges are densely wooded, and magnificent views are obtained from many points. There is a remarkable contrast between the upland, typically Australian vegetation and the luxuriant flora of the lower valleys, where tropical elements, such as *Ficus*, characteristic of the northern Australian flora, mingle with a southern element represented by a luxuriant growth of ferns, including the tree-ferns *Dicksonia* and *Alsophila*, and in damper spots filmy ferns. On the further slope of the mountains bordering the stream which issues from the Jenolan caves, a remarkable series of limestone caverns, were fine specimens of *Callitris Cunninghamii*, the largest species of the genus; it frequents freshwater streams.

The Government has retained as a national reserve six square miles of country round Jenolan; wallabies range unmolested over the rocks, and the platypus takes his early morning bath in the stream, the trees shelter numerous brightly coloured parrots, and the Australian magpie, the satin-bird, and many others, are in evidence. On the steep cliff-faces are patches of the "rock lily," a terrestrial Orchid (*Dendrobium speciosum*) with a habit recalling the lily-of-the-valley. A walk along the valley, under the guidance of Mr. R. H. Cambage, an excellent local botanist, yielded specimens of *Sambucus xanthocarpa*, the fragrant-flowered *Pittosporum undulatum*, *Dodonæa viscosa*, *Hymenanthera dentata* (a woody Violaceæ), *Hedycarya Cunninghamii* (Lauraceæ), *Coprosma hirtella* (Rubiaceæ), *Pomaderris apetala* (Rhamnaceæ), *Bursaria spinosa*, *Solanum aviculare*, these forming bushes or small trees; while *Acacia melanoxylon*, *Eucalyptus melliodora* (yellow box-tree), and *Sterculia diversifolia* were conspicuous among the larger trees. Among the undergrowth were species of *Senecio*, the large-flowered *S. macranthus*, with *S. australis* and *S. lautus*, an "everlasting," *Helichrysum semipapposum*, *Epilobium tetragonum*, and of Papilionaceæ *Indigofera australis*, *Daviesia latifolia*, and the climber *Kennedya monophylla*.

Another excursion through a different type of country was made in the company of Mr. Maiden. Passing southwards from Sydney through marshy country, we crossed King George's river, up which Robert Brown botanized from a small boat, then passed through the extensive National Reserve, where, among other plants of interest, was the remarkable Amaryllid, *Doryanthes excelsa*, with large sword-shaped leaves and tall flowering stem ending in the massive crimson inflorescence. Following the coast road we passed fine specimens of the tall native palm, *Livistona australis*, and then ascending the steep coast cliff to Bulli were again in typical New South Wales bush-vegetation. The varied flora included species of *Banksia*, *Hakea*, *Grevillea*, *Isopogon*, *Persoonia*, with berry-like fruit, and *Petrophila* among

Proteaceæ, several species of *Leucopogon* and *Woolsia pungens* (Epacrideæ), *Hibbertia* (Dilleniaceæ), *Boronia* and *Zieria* (Rutaceæ), *Pomaderris*, *Dampiera* (Goodeniaceæ), *Billardiera scandens* (Pittosporaceæ), *Dillwynia ericifolia*, *Acacia longifolia* and *decurrens*, and *Casuarina suberosa*. Together with Mr. Maiden also I made a pilgrimage to the classic spot at Kurnell on Botany Bay, where Captain Cook landed from the "Endeavour" with Sir Joseph Banks and Dr. Solander in 1770, and formally took possession of the country for Great Britain. The place is practically unchanged—a column marks the landing-place, and a little to the left is the small stream of water at which the crew were refreshed. Nearer the entrance to the Bay rise the cliffs from which the little expedition was threatened by natives; the opposing capes which guard the entrance bear the names given by Cook—Cape Banks and Cape Solander. On the other side of the Bay, opposite Kurnell, rises a column in memory of La Perouse, the French navigator, who touched there in 1778. He was never heard of again; but more than thirty years later the wreck of his ship was found.

On the way home I spent a week in New Zealand, including three memorable days with Dr. Cockayne at Wellington. One was at Day's Bay, where an area of forest, consisting of more than 600 acres, has been recently acquired as a Natural History Reserve. The gullies contain a luxuriant rain-forest vegetation, a rich fern-flora with tree-ferns—*Cyathea dealbata* and *medullaris*, a wonderful diversity of filmy ferms (*Hymenophyllum*), and great patches of *Trichomanes reniforme*. Among the numerous lianes are *Metrosideros* (Myrtaceæ), *Rubus australis*, *Clematis monophylla*, *Parsonsia heterophylla* (Apocynaceæ), a fern, *Blechnum filiforme*, showing marked heterophylly, *Freycinetia Banksii*, and the remarkable liliaceous *Rhipogonum scandens* (aptly named supple-jack); the branches are loaded with epiphytes, including numerous ferns, but the most conspicuous is *Astelia Solandri* (Liliaceæ). Among the characteristic trees are the Nika palm, *Areca sapida*, the lance-wood, *Pseudopanax*, the long leaves forming the crown of which become strikingly narrower as the plant grows older, *Knightia excelsa*, *Weinmannia racemosa*, and on the drier slopes tall specimens of the subantarctic beech, *Nothofagus*, two species of which were noted, *N. fusca* and *N. Solandri*. Here, too, one finds *Tmesipteris*, the archaic fern ally. On the higher parts *Nothofagus* gives place to the rata, *Metrosideros*, and some of the epiphytes become terrestrial, notably *Astelia*, which seems to thrive equally well in either condition; a terrestrial *Dendrobium*, *D. Cunninghamii*, grows with a cane-like stem like a tiny bamboo. Another trip was to a taxad forest, where the slopes of the gully bore a very mixed wood, including fine trees of *Dacrydium cupressoides* and *Podocarpus dacrydioides*; the very bottom of the gully, through which ran a stream, was a veritable fern paradise. In an area so typically New Zealand in character, it was interesting to note the intrusion of our northern flora; at one place the stream was crisp with a splendid crop of watercress, while

near a rotting trunk, the home of numerous *Peripatus*, we found a specimen of Herb Robert, with *Geranium molle*, completely naturalized.

The alien vegetation is a conspicuous feature in the settled portions of Australia and New Zealand. The dominant plant on the hill-slopes of Wellington Harbour was gorse, in brilliant flower early in September, growing with such typical New Zealand plants as *Aciphylla squarrosa* and *Phormium Cookianum*. In South Australia the fields were in places yellow with a South African *Oxalis* (*O. cernua*), and another Cape species, *Mesembryanthemum acinaciforme*, also occurs on sand near the coast; while two South African species of *Gomphocarpus* (*arborescens* and *fruticosus*) grow freely on the foothills of the Mt. Lofty range. Areas lying fallow at Nobelius's nursery at Emerald bore many familiar British weeds of cultivation. In South Australia alone Mr. J. M. Black estimates at at least 400 the number of alien plants more or less naturalized and propagating spontaneously; of these it is probable that 300 are permanently established. About 100 are from the Mediterranean region, which has supplied some of the most aggressive immigrants.

The New Zealand forest, where it is not cleared for cultivation, is being replaced by Northern species. In the volcanic district of Rotorua Mr. Goudie kindly showed me over the Government nursery under his charge. He had many interesting native trees, such as *Dacrydium*, *Podocarpus*, and *Phyllocladus richomanoides*, but was planting extensively Northern conifers such as *Pseudo-tsuga Douglasii* and *Pinus insignis*. The hillsides behind the hot springs bore a fine young forest of the last-named; this, Mr. Goudie explained, yielded big timber in thirty-five years, which would take the slow-growing native *Podocarpus* 250 years to produce. Near Mt. Tarawera, where the country for miles round was devastated by the eruption of 1886 (in which the famous pink and white terraces were destroyed), I passed through a young forest of purely European character—poplar, *Robinia pseudacacia*, elder, and a familiar undergrowth of dog-rose. The king of New Zealand forest trees, the kauri (*Agathis australis*), has a limited range in the north of the North Island, but is being rapidly used up. The huge column-like trunks rise sometimes for more than 80 ft. without a branch, and from the top spring the short, enormously thick branches. The tree has disappeared from the neighbourhood of Auckland, except from a piece of Reserve known as the Kauri Glen, a few miles away, to which Mr. T. F. Cheeseman somewhat reluctantly directed me as being but a poor remnant of departed glory. It is remarkable that a country of such supreme and in great part rapidly changing or disappearing botanical interest as New Zealand should have no professorial botanist at any of its several Universities. In each case the Professor of Biology is primarily a zoologist. I had the pleasure of meeting at Wellington Prof. Kirk, the son of the well-known botanist, who is as keenly botanical as his mixed biological appointments will allow; but it is to a private individual, Dr.

Leonard Cockayne, that we owe a description of the plant biology of the islands, while Mr. Cheeseman, Curator of the Auckland Museum, and withal a great authority on Maori lore, has brought an unrivalled knowledge to the preparation of his excellent *Manual of the New Zealand Flora.*

BIBLIOGRAPHICAL NOTES.

LVIII.—Smith's 'Flora Britannica.'

No single event in the history of botany in England has had more far-reaching results than the acquisition of the famous Linnean Herbarium by Sir J. E. Smith in 1784. The impetus it gave to a more thorough knowledge of our insular flora was in itself of first-rate importance. There had been no dearth of British floras prior to this time, but an examination of these with the material contained in the Linnean Herbarium convinced Smith "that the nomenclature of our whole flora stood in need of revision," and suggested to him the advisability of preparing an entirely new work on the subject. A few years later Smith was contributing anonymously to our knowledge of British plants through his descriptions in *English Botany*.

The important position which that work was destined to occupy was not dreamt of at its inception. It "owed its origin to a number of sketches of plants made by James Sowerby, to be introduced in the foregrounds of landscapes"; these he was induced by various botanist friends to issue as plates. Smith undertook to write the text for them, and thus began his most enduring work (Loud. Mag. Nat. Hist. i. 304). But its disadvantages, consequent upon the haphazard selection of the subjects depicted, and the length of time its ultimate completion presumed, were not forgotten by Smith, who aimed at a systematic flora in Latin. In claiming authorship of *English Botany* he informs us that the *Flora Britannica* "which has long been projected," and which "the *English Botany* will serve to illustrate," was then preparing (E. B. iv. p. ii. 1795). It was not until 1800, however, that the first two volumes were published in London, and a further four years elapsed before vol. 3 was given to the world. The work concludes with the Musci; a fourth volume was contemplated, but never appeared. The *Flora* was most favourably received, and an annotated reprint was issued by J. J. Römer at Zurich in 1804–05; additional stations for many of the species are given in this, chiefly on the authority of L. W. Dillwyn's 'Catalogue of the more rare plants found in the environs of Dover' in Trans. Linn. Soc. vi. 177–184 (1802).

An epitome of the first two volumes was issued in London in 1800 under the title *Compendium Floræ Britannicæ*; this was translated and accommodated to the German flora by G. F. Hoffmann, and published at Erlangen in 1801. An English edition by J. Galpine, which continued the enumeration of the species in the parent work to the end of the flowering plants, was

published at Salisbury, 1806; the dedication is dated from Blandford, Jan. 1, 1806, nine days before the author's death. Subsequent enlarged editions of the Latin *Compendium* were issued in London in 1816, 1818, 1825 and 1828, the year of Smith's death. Galpine's *Synoptical Compend* enjoyed a considerable popularity and ran into several editions. Pritzel in the first edition of his *Thesaurus* mentions one published in London in 1813; this is omitted from the second edition of his work, and I can nowhere find further reference to it. The "second edition" was issued anonymously, as were the subsequent editions. It owed "its enlargement and correctness to the kind revision of one of the most distinguished members" of the Linnean Society, and was published at Liverpool in 1819 and in London 1820. The copy in the Department of Botany formerly belonged to William Wilson, who has indicated the wild plants observed by him within a thirty mile circuit of Warrington. Loudon (Gard. Mag. v. 564) supplies the name of Miss Elizabeth Kent for the "third edition," London, 1829; a so-called "fourth" consists of the "remainder" copies of this, with an additional preface and a title-page dated 1834.

The simultaneous preparation of the *English Botany* and the *Flora Britannica* permitted their author to refer impartially from one to the other before actual publication had been effected; and this, where questions of priority of publication are involved, sometimes causes confusion. An intimate knowledge of the works themselves and of the literature dealing with them furnishes sufficient data to decide many such points. Taking the first two volumes of the *Flora*, we find that Smith dates his preface March, 1800, and that their receipt is acknowledged in a congratulatory letter to the author from Sir Thomas Frankland dated 29 April, 1800 (Sm. Corr. i. 450). I have failed to find any reference in them to the *English Botany* plates of that year, but early pages of the *Flora* are cited in the latter many months before their publication. The great majority of the *English Botany* plates have a date engraved upon them, which is commonly taken as affording evidence of publication. In reality it is the date from which its copyright was vested in the engraver, whose pecuniary interests would be best served by fixing on the nearest possible date to that on which it was offered for sale, thus enjoying the protection of the Act, passed on his behalf, for the maximum length of time. This date often affords valuable evidence, but it must not be regarded as absolute proof of what nomenclaturists rank as "effective publication." For example, although t. 1065 (*Carex teretiuscula*) is dated Dec. 1, 1796, it did not appear until 1802 in E. B. vol. xv. With this exception, any plate bearing prior date to April 1, 1800, may be assumed to antedate the *Flora Britannica*. I am unable to decide in the case of those of even date (tt. 715–726), but those of a later date appeared subsequent to the first two volumes of the *Flora*; although the citations sometimes rank as "ined.," this indication is of no nomenclatorial value.

The publication of the third volume of the *Flora* was delayed

until 1804. It is evident that the manuscript of this was in an advanced state, and some of it even in print, when the earlier volumes were issued. The delay is explained by Smith in his preface to vol. i., but this has been very generally overlooked in this connection. It may be supplemented by an extract from a letter from Smith to Dryander, preserved in the Department of Botany:—

"My publisher White writes me word that on account of the high price of paper he would wish to publish the 2 vols. of Flora Britannica already printed, and postpone the rest (which will make two more) till paper is cheaper. He wishes this to be expressed in the preface, and thinks we may promise the remainder to be published this time twelvemonth. These 2 volumes go to the end of Syngenesia. I think it will be necessary to give an Index of the Genera in them. Would you advise an Index of English names? I think it may be spared, as it will be superseded (as well as the Index of the Genera) by a complete Index at the end of the fourth volume, but this is a point on which I beg your advice. . . . As to title, I think Flora Britannica will be simplest and best." Dryander replied to this on March 3. The following March, Smith, writing to the editor of the *Monthly Review*, gives his reasons for the continued delay (Sm. Corr. i. 452). The volume eventually appeared about March, 1804, but will be found quoted in *English Botany* four years previously. Bearing the above facts in mind, few questions of priority of publication in respect of this work and the *English Botany* need go undecided. In conclusion, it may be pointed out that the late Dr. Reynolds Green, in his account of Smith in the posthumous *History of Botany in the United Kingdom* (pp. 255, 257) published in October, confuses this work with the *English Flora*, a much later work.

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REVIEWS.

Unsere Freiland-Nadelhölzer. Edited by Ernst Graf Silva Tarouca. With 307 illustrations in the text, 6 uncoloured plates and 12 coloured plates. 302 pp. Large 8vo. Vienna: F. Tempsky. Price 18 marks.

This is a joint work of nine authors, edited for the Dendrologischen Gesellschaft of Austria-Hungary by its President, Herr Ernst Tarouca. It is, however, apparently only in the first and General Section of the book that these writers have collaborated, the Special Section being, it would seem, entirely the work of Herr Tarouca. As there are only three hundred quarto pages and more than that number of text-illustrations, there is obviously not room for very much text; but what there is seems excellently adapted for its purpose, which is that of the ornamental planter rather than the botanist.

Among the introductory chapters, Mr. Ernest Wilson con-

tributes one on Chinese conifers, Mr. Alfred Rehder one on those of North America, Herr Franz Zeman one on cultivation, Herr Camillo Schneider one on the animal and plant foes of the Coniferæ and a glossary of descriptive terms. In the Special Section there is an excellent synopsis of families and genera, followed by a dichotomous key based upon branching, buds and leaves, the latter half of the volume being occupied by the description of the species and varieties in cultivation under their genera arranged alphabetically.

The text-illustrations are admirable, but difficult to find, as there is no list of them and no index, nor are they often associated with the text in their neighbourhood. They include fine pictures from photographs of specimen trees, an interesting series of seedlings and juvenile forms, and very good analytical details of species, dealing, for instance, with twenty-seven forms of *Abies*, eight of *Cupressus*, twenty-one of *Juniperus*, eight of *Larix*, and twenty-one of *Picea*, though *Pinus* is not dealt with on quite so liberal a scale. There are also six folding plates with figures of more than one hundred cones. The whole book has to be printed on a surfaced paper which renders it inordinately heavy, and the coloured plates add but little to its attractiveness. Pictorially it is more sumptuous than the *Manual of the Coniferæ* which the late Adolphus Kent prepared for Messrs. Veitch, with which it, of course, invites comparison; but it cannot be compared with that work for scientific completeness of treatment.

G. S. Boulger.

Plant Life. By Professor J. Bretland Farmer. Home University Library. Williams and Norgate. Price 1*s*. 256 pp. Small 8vo.

There is such a plethora of little books on botany that one views every newcomer with suspicion, almost with a preconceived dislike. The little book that seems to profess an exhaustive treatment of a great subject up to a University standard arouses an even deeper indignation. Prof. Farmer, however, has made no such mistake in carrying out the difficult task that has fallen to his lot. His little book is most original both in conception and in execution: it makes no pretence to exhaust any topic; and—what is to our mind its greatest merit—it does not do the reader's thinking for him, but is essentially suggestive. Not only does he face such difficult problems as the *rôle* of enzymes in nutrition, but he illustrates the differences between plant and animal by a comparatively full account of such an organism as *Chlamydomonas*, and discusses "non-cellular" or cœnocytic types of organisation, the distribution of the stereom in relation to the mechanical necessities of the plant, and special adaptations such as those of climbing, aquatic, epiphytic and parasitic plants. The main principles of normal nutrition are brought out by the exposition of the contrasting exceptional methods, and the principles of reproduction are concisely—perhaps too concisely—dealt with, whilst throughout cryptogams and phanerogams are treated from the same physiological point of view. This does not

make an easy book to read. As in other similar cases, such as Clerk Maxwell's *Matter and Motion*, the reader will often regret the cramped space at the writer's disposal; but the result is a work which is eminently stimulating mental pabulum.

G. S. Boulger.

BOOK-NOTES, NEWS, &c.

At the meeting of the Linnean Society on November 19, 1914, Mr. C. H. Wright gave a summary of his paper, "The Mosses and Hepaticæ of West Falkland Islands, from the collections of Mrs. Elinor Vallentin." Having made a collection of phanerogams and ferns, which formed the basis of a paper published in Journ. Linn. Soc. (Bot.) xxxix., Mrs. Vallentin returned to the Falkland Islands and made collections of the lower Cryptogams. The present paper contains the determinations of this collection and attempts to bring together the information previously published on other collections. Gaudichaud, in 1825, enumerated six mosses and three hepaticæ collected during Freycinet's voyage. D'Urville in the Mém. Soc. Linn. de Paris, iv. p. 597, gave a more extended list. Sir J. D. Hooker in his *Flora Antarctica* extended the number to forty-three mosses and twenty-seven hepaticæ. More recently the moss flora has been dealt with by Dusén and Cardot. The genera represented are either terrestrial or aquatic, and the species much resemble those from the northern hemisphere. Many are capable of resisting cold and drought, such as they are exposed to in these wind-swept islands. Very little affinity is shown with the flora of New Zealand and the subarctic islands to the south of it. Dr. Skottsberg, in his *Studien über das Pflanzenleben der Falklandinseln*, has indicated the special plant-formations with which the mosses and hepaticæ are associated. The proportion of Pleurocarpi to Acrocarpi is very small. The paper was illustrated by specimens and coloured drawings made by Mrs. Vallentin.

At the meeting of the same Society on December 3rd, 1914, Mr. Cyril West explained the main points of a paper written by him in collaboration with Mr. Hisayoshi Takeda on *Isoëtes japonica* A. Br. He stated that *Isoëtes japonica* A. Br., which has a fairly wide distribution in Japan, is the largest known species of this genus; according to Makino, a diameter of 8 cm. is attained by the caudex of very large specimens. The tri-lobed caudex consists of two distinct structures, *viz.* stem and rhizophore, to which the leaves and roots are respectively attached. But owing to the stunted growth of the plant, all external morphological differentiation between the two organs has been completely lost. The actual apex of the stem has the form of a conical mass of tissue situated at the base of a funnel-shaped depression in the cortex. In this protuberance no definite apical cell can be distinguished. The cauline primary vascular axis is a non-medullated monostele. Primary phloem surrounds the central xylem core. An endophytic mycorhiza is found in the

peripheral cells of the primary cortex. The cambium forms secondary cortex externally and secondary phloem internally. Sieve-tubes with sieve-areas of the typical cryptogamic type occur both in the primary and in the secondary phlœm, and are continuous with those of the leaf-traces. The roots, the vascular bundle of which is collateral monarch with endarch protoxylem, are arranged in a very regular manner on the root-bearing organ of the plant. The primary growth of the rhizophore proceeds from a primary meristem situated along three radiating lines corresponding with the furrows of the caudex. The primary and secondary tissues of the rhizophore are essentially similar to the corresponding tissues of the stem and therefore need no further description.

The second number of the *Annals of the Bolus Herbarium* (Cambridge University Press, 5s. net) contains illustrated papers by the editor, Dr. H. H. W. Pearson, on the internal temperature of *Euphorbia virosa* and *Aloe dichotoma*, and by Mr. W. C. Worsdell on the stem-anatomy of these plants. Messrs. L. and F. Bolus and R. L. Glover continue the enumeration of the plants collected on the Great Karasberg by the Percy Sladen Memorial Expedition in 1912-13, and the first-named describes two new species of *Erica—E. Muirii* and *E. Hameriana*: these are figured, as are also those of species in the Great Karasberg enumeration, although no reference to these is made in the text—a somewhat inconvenient omission.

Under the title *The Scinaia Assemblage* (Univ. of California Publications in Botany, vi. 79-152, 7 plates) Professor W. A. Setchell publishes a valuable monograph of *Scinaia*, a difficult genus of marine algæ, and of its allies *Gloiophloea* and *Pseudoscinaia*—the latter a new genus. It is interesting to note that the type of *Scinaia* is Dawson Turner's *Ulva furcellata* collected at Sheringham, in Norfolk. The genus *Scinaia* was established by Bivona in 1822 at Palermo in a publication now excessively rare. The name was lost sight of until J. G. Agardh re-established it in 1851; but in the meantime the plant had been set up as a new genus—*Gimmania*, by Montague (1842) and *Myclomium*, by Kützing (1843). Professor Setchell recognizes eleven species, five of which are new to science. In *Gloiophloea* he places seven species, four of which are new to science; and in *Pseudoscinaia* two species, both new. He gives full diagnoses and synonymy of every species, followed by important critical notes, and concludes with an interesting chapter on geographical distribution. *Scinaia* seems to be essentially a northern hemisphere type, since nine of its eleven species are confined to a position north of the Equator, and these represent all the various types of structure within the genus. *Gloiophloea* and *Pseudoscinaia* have each an equal number of species in each hemisphere. The paper is a valuable addition to algological literature; and the numerous figures showing differences of structure in the species should be of great assistance in the determination of species.—A. & E. S. G.

British mycology has suffered a great loss through the death of the Rev. William Leigh Williamson Eyre on October 25th last at Swarraton, Hants. Mr. Eyre was born at Padbury, Bucks, on March 17th, 1841. He was educated for the merchant service, and went to sea at an early age. After a few years he gave up seafaring. He was ordained deacon in 1865 and priest in 1866, and in 1875 became rector of Swarraton and vicar of Northington, Hants. He early took up the study of fungi, and was a member of the Woolhope Club in the days of Dr. H. G. Bull, when the study of the larger fungi was carried on with vigour and enthusiasm at the autumn meeting at Hereford. After Dr. Bull's death the Hereford foray very rapidly lost its place in the affections of mycologists, and, although the foray of the Yorkshire Naturalists' Union to some extent afterwards replaced it, there was really no satisfactory arrangement for the meeting of mycologists until the formation of the British Mycological Society in 1896. In the season 1903 he was elected president, and gave as his address "Mycology as an Instrument of Recreation." The only other paper appearing in the Transactions is "Notes on Hants Fungi" (1899). Eyre was responsible for the list of Hampshire fungi in the *Victoria County History*, and in 1907 published "A list of the Fungi of the Grange Park and Neighbourhood, Hampshire"; he receives recognition in *Chlorospora Eyrei* Mass. and *Poria Eyrei* Bresad. He gave great assistance to M. C. Cooke by providing rare species for the *Illustrations*; his new finds have been described since Cooke's retirement by Mr. Carleton Rea. Eyre was an ardent naturalist, and was a member of the Hampshire Field Club from its formation, the "Papers and Proceedings" of the Club containing several communications, principally on fungi. For many years he made a close study of the genus *Rubus*, and his collection is in the Educational Museum at Haslemere, together with his collection of Mycetozoa. He was a Fellow of the Royal Meteorological Society, and for many years kept tabulated records of the district round Swarraton. In all he did he showed extreme care and great enthusiasm; his geniality and generosity will be much missed by his many acquaintances.—J. R.

A meeting of the General Committee of Organization for the International Botanical Congress, which was arranged to be held in London in May, will be held at the Linnean Society's Rooms, Burlington House, Piccadilly, on January 21, at 6.30 p.m. The Committee will be asked to consider the question of the postponement or abandonment of the Congress.

The *Journal of the Royal Horticultural* Society for November contains a monograph of the South African Gerberas, by Mr. R. A. Dümmer, in which three new species, *G. glandulosa*, *G. Burchellii*, and *G. Lynchii* are described, and several new varieties. Dr. Farmer has two papers on the plant in relation to its physical and biological environments, and Mr. W. J. Bean writes on Chinese trees and shrubs.

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JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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Nitella Dixonii *H. & J. Groves.*

A NEW NITELLA.

By James Groves, F.L.S.

(Plate 536.)

In May, 1911, the eminent bryologist, Mr. H. N. Dixon, discovered a *Nitella* growing in a ditch by the roadside at Caldas de Monchique, in a pond between Caldas de Monchique and Monchique and in a water tank at Monchique, all within a small area, in the province of Algarve, which forms the extreme southern portion of Portugal. In each of the localities the water was shallow. The plant was dicœcious and both sexes were collected. Mr. Dixon handed his specimens over to us for examination, and they proved to belong to a new species of the group Polyarthrodactylæ. The following diagnosis was in course of being drawn up just before my brother's last illness.

Nitella Dixonii, H. & J. Groves, sp. nov. Sectio *Nitellæ Polyarthrodactylæ Diœciæ*, Braun. Statura mediocris. Caulis usque ad 525 μ crassus. Verticilli steriles ut etiam verticilli fertiles inferiores quam internodis breviores. Verticillorum ramuli pq. 8, bis-, ter-, interdum quater-furcata sed radiorum secundariorum ramuli nonnulli, et radiorum tertiariorum plurimi, simplices. Radii primarii circ. $\frac{2}{5}$ totius ramuli longitudine. Radii ad furcam primam nodorum fertilium 4–5, nodorum sterilium 5–7, quum denuo furcati circ. $\frac{2}{3}$ primariorum radiorum longitudine, quum simplices valde elongati; ad furcam secundam 4–5, quum denuo furcati, breves, quum simplices, elongati; ad furcam tertiam 3–4, valde inæquales; ad furcam quartam, quum quidem præsentes pq. brevissimi, sæpe curvati. Radii ultimi, sive secundarii, tertiarii, quartarii, aut quinarii inæquales, sed sæpe elongati, 3–5- (pq. 4-) cellulati, cellulæ infimæ pq. magnopere extensæ, superiores gradatim diminutæ sed cellulæ penultimæ haud brevissimæ. Cellula ultima brevissima conica acuta, ad basin quam cellulæ penultimæ cacumene truncato angustior. Antheridia sæpe geminata, ad secundam, et ad primam interdum, furcam posita; diametro 325–410 μ. Fructus solitarii 475-550 μ longi, 360–410 μ lati, in furcis omnibus, sed in furca prima raro positi. Oospora complanata, circ. 320 μ longa, 270 μ lata, 230 μ transversa, liras tenues prominentes 8–9 exhibens. Coronula minuta.

A slender graceful plant with the branchlets usually diffusely branched with unequal rays and long whip-like end-segments similar to those of *N. ornithopoda*. In the form from the water-tank at Monchique the rays in some of the upper whorls are shortened, giving them a tufted appearance as shown in fig. 2. I have not found a sufficiently ripe oospore to enable me to describe the surface of the membrane.

Apart from other characters, *N. Dixonii* may be distinguished from the majority of the Polyarthrodactylæ, both dicœcious and monœcious, by the shape and comparative length of the ultimate cells of the end-segments, which in *N. Dixonii* are always conical

and acute, and not usually more than three times as long as broad, often much less.

The other species of the section with conical acute ultimate cells, with the exception of *N. ornithopoda*, may be roughly differentiated from *N. Dixonii* as follows:—*N. plumosa* by the fruits being produced in the base of the whorls, by the smaller oospores showing less numerous ridges, by the branchlets being less divided and having the more uneven *Tolypella*-like development of the rays; *N. diffusa* by the less frequently divided branchlets with less numerous rays at each forking, by the shorter end-segments with more graduated cells, and by the oospore showing less numerous ridges; *N. huillensis* by the larger pear-shaped antheridia, by the shorter not whip-like end-segments, and by the antheridia and fruits being produced in small mucous heads; *N. cristata* by the very pronounced ridges of the oospore, the branchlets being less divided and the end-segments being shorter often two-celled; *N. Arechavaletæ* (from author's description) by the small fruiting heads enveloped in mucus, once-forked branchlets, and many other characters; *N. Hookeri* by being monœcious, having fewer rays at each forking and greatly elongated lower cell to the end-segments, the other cells forming a mucro; *N. bonaerensis* (from author's description) by being monœcious, by having minute subglobose fruits showing fewer spirals, fewer branchlets, &c.

N. ornithopoda, to which *N. Dixonii* is most nearly related and which it much resembles in appearance, is monœcious, has smaller antheridia, fewer ridges showing on the oospore, and the ultimate cells of the end-segments are often longer. Were *N. Dixonii* monœcious, the differences would perhaps be considered hardly sufficient to separate it as a species, and in any natural arrangement it must be put alongside *N. ornithopoda*.

Braun, no doubt rather as a matter of convenience and only provisionally, divided his sections of the larger genera of the *Characeæ* into monœcious and diœcious species. This is clearly an artificial arrangement, as there is often closer relationship between a species which is monœcious and one which is diœcious than with the other monœcious plants of a section, or *vice versâ*, and although there is no authenticated case of monœcious and diœcious forms of the same species, there are several monœcious species which show a decided tendency towards the diœcious character. In the genus *Chara*, for instance, we find such plants as *C. Rabenhorstii* with fruits and antheridia produced at different nodes of the same branchlet, and with the larger antheridia characteristic of diœcious species. A very interesting plant akin to *C. vulgaris*, collected in the spring of 1914 by Mr. T. B. Blow, in the south of Spain, shows a further step in this direction. In it the fruits and antheridia are sometimes produced on separate branchlets of the same whorl, while the antheridia are very large, the diameter being twice that of normal *C. vulgaris*. In *Tolypella* a still further stage appears to be reached, as Dr. Prosper, in his admirable work on the Spanish

Characeæ,* describes a new species, *T. giemensis*, in which the antheridia and fruits are produced on different branches, and in this case also the antheridia are very large.

Mr. Dixon's discovery of a fresh European member of the Polyarthrodactylæ is of great interest, as this group are for the most part plants of the Southern Hemisphere, nine species belonging to Australasia, three to South America, and three to South Africa. In the Northern Hemisphere, one species occurs in North America, one in Japan, one in the Sandwich Islands, one in West Africa, and two, *N. ornithopoda* and *N. Dixonii*, in Western Europe. For the purposes of this summary of distribution the numbered plants in Braun and Nordstedt's *Fragmente* are taken as species, with the addition of others subsequently described, and, as they stand, it is a curious fact that each species is confined to one of the districts mentioned, and almost all of them are apparently restricted to comparatively small areas. No doubt further research will result in the combination of some of the present species and the extension of the known distribution of others, but it seems evident that in this section there are no species with a very extended range.

EXPLANATION OF PLATE 536.

1. Portion of female plant, nat. size. 2. Ditto, tufted form. 3. Portion of male plant, nat. size. 4. Branchlet of fertile whorl, female, × 6. 5, 6. Tips of end-segments, × c. 100. 7. Antheridia, × 50. 8. Fruit, × 50. 9. Oospore, × 50.

SOME SCOTTISH RUST FUNGI.

By MALCOLM WILSON, D.Sc., F.L.S.
Lecturer in Mycology, University of Edinburgh.

THE fungi described in the following notes have, with the exception of *Puccinia borealis*, been collected in Scotland during the summers of 1913 and 1914, for the most part in alpine situations. In their identification extensive use has been made of the work on the *British Rust Fungi* by W. B. Grove (1913), and references to several of the papers mentioned will be found in this book. The list of the British Uredinales, published by Mr. Ramsbottom in the *Transactions of the British Mycological Society* (1913), and the book on *Mildews, Rusts and Smuts*, by Mr. Massee (1913), have also been consulted. I wish to express my thanks to Mr. Ramsbottom for his valuable help in the identification of some of the species.

PUCCINIA PROSTII Moug.

Puccinia Prostii has been recently recorded in Britain by Massee on cultivated tulips, but no particular locality is given. On the Continent it has been found in France and Italy on *Tulipa sylvestris* and *T. australis*. This rust was recently discovered in the Royal Botanic Garden, Edinburgh, attacking a bed

* Dr. E. R. Prosper, *Las Carofitas de Espana*, Madrid, 1910.

of *Tulipa sylvestris*, and doing considerable damage to the plants, which produced few flowers.

The sori, which occur on both surfaces on the leaf, are usually confined to one longitudinal half of the lamina; there is no discoloration of the leaf around the sori. In addition to teleuto-spores, spermogonia are abundantly produced on the leaves, although in previous descriptions of the fungus there is no mention of these organs. Two kinds of markings are obvious on the leaves:—

(1) Yellowish-brown areas, ellipitical or circular in shape, in which the epidermis is apparently unbroken.

(2) Grey or slate-coloured, usually spindle-shaped, areas, many of which show a longitudinal slit from which the brownish-black masses of teleutospores project.

It appears that the spermogonia are first produced and give rise to the yellowish-brown spots, and that later on teleutospores are formed on the same sorus. In the early stages of develop-ment the areas remain yellowish-brown, but as the teleutospores approach maturity an air space develops under the epidermis, and in consequence grey or slate coloured spots are produced.

The mycelium, which is easily seen in a section of the leaf, consists of rather large hyphæ containing yellowish-brown granules. The spermogonia are amphigenous, yellowish-brown in colour and flask-shaped, with slightly projecting neck 120–140 μ in diameter. The spermatia are oval and unusually large, about 10 × 5 μ. The teleutospore sori are amphigenous; spores brown, scarcely constricted, covered with rather long hyaline spines 56-62 × 17–19 μ; epispore rather thick, 2–3 μ; pedicels variable, shorter or longer than the spore, up to 80 μ in length, hyaline, deciduous.

I wish to thank Mr. W. B. Grove for kindly confirming the identification of this species.

Puccinia borealis Juel.

The æcidial stage of *Puccinia borealis* on *Thalictrum alpinum* L. was first described by Greville in 1823 in his *Scottish Cryptogamic Flora* as *Æcidium Thalictri*. He states "the specimens were discovered by Mr. Patterson on Ben Voirlich in one of W. J. Hooker's excursions in 1821: since which time I have received a specimen from Arnott gathered by MacRitchie in the Highlands." Greville's record appeared in several of the older works on the British fungi; Berkeley included it in his *Outlines of Fungology* (1860); Cooke, in his *Synopsis of the British Æcidiacei* in 1864, described it as not uncommon in Scotland, and it is referred to in his *Handbook of British Fungi* (1871) as *Æcidium Ranunculacearum* var. *Thalictri* Grev. It is omitted, however, from Plowright's *British Uredineæ and Ustilagineæ*, and also from the recently published works on the rust fungi.

Greville's discovery has also to a certain extent been overlooked on the Continent. In the *Sylloge Fungorum* (1888) Saccardo gives *Æcidium Thalictri* Grev. as a synonym for *Æcidium*

Sommerfeltii Johans.; both these æcidial stages occur on *Thalictrum alpinum*, but the confusion between the two is somewhat surprising, since each has a very different effect upon the host plant.

In 1894 Juel* showed that the æcidiospores of *Æcidium Thalictri* Grev. infected *Agrostis borealis* Hartm., and produced uredospores and teleutospores upon it, and that *Anthoxanthum odoratum* L. probably also served as a second host plant. He accordingly suggested the name *Puccinia borealis* for the fungus. There is no doubt that Juel fully recognised the identity of his Scandinavian specimens with Greville's Scottish plant.

In view of the omission of this fungus from recent British works a translation of Juel's description is given:—Spermogonia absent. Æcidia (*Æ. Thalictri* Grev.) few (about 8–12) together, seated on unthickened spots, which become pale or reddish; pseudo-peridia at first cylindrical, later with torn revolute margins; spore mass orange; spores with finely punctate wall about 13 μ in diameter. Uredospore; sori hypophyllous, elongated, situated on pale spots; spores 15–18 μ in diam., with moderately thin, rather finely verruculose walls and with orange-coloured contents; paraphyses absent. Teleutospores; sori hypophyllous, covered by the epidermis, small linear, or irregularly fused, black; spores of rather variable form, brown, very shortly stalked, about 35–45 × 12–18 μ, upper cell with somewhat thickened wall at the apex; paraphyses absent.

Æcidia on *Thalictrum alpinum* L. Uredospores and teleutospores on *Agrostis borealis* Hartm., and very probably on *Anthoxanthum odoratum* L. In the mountain regions of Sweden and Norway; without doubt also in Scotland and Greenland.

Greville's type specimen collected on Ben Voirlich (Loch Lomond) by Patterson in 1821 is preserved in the Herbarium of the Royal Botanic Garden, Edinburgh. A search has recently been made for the fungus on Ben Voirlich, but, unfortunately, no trace of it has been found on *Thalictrum alpinum*; a uredospore stage has been discovered on *Anthoxanthum odoratum* on this mountain, but as paraphyses are present this evidently does not belong to *P. borealis*; it appears to be similar to the specimens collected by Plowright at King's Lynn in 1884, and identified as *P. Anthoxanthi* Fckl.

Greville's description and the existence of his type specimen clearly justify the inclusion of this species in the British Uredinales.

Puccinia septentrionalis Juel.

The æcidial stage of *Puccinia septentrionalis* on *Thalictrum alpinum* was described by Johanson from Iceland in 1885, who gave it the name of *Æcidium Sommerfeltii*; he pointed out that it was distinguished from *Æ. Thalictri* Grev. by the production of its æcidia on swollen red or violet coloured spots on the stems and

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* Mykologische Beiträge v. Öfvers af K. Vet-Akad. Förh. No. 8, 1898, p. 411.

leaves of the host plant. Juel * in 1895, working with material collected in Norway and Sweden, showed that the spores of *Æ. Sommerfeltii* were capable of infecting *Polygonum viviparum* and *P. Bistorta*, and that uredospores and teleutospores were produced on these hosts. He accordingly gave the name *Puccinia septentrionalis* to the fungus.

Æcidium Sommerfeltii has been found in Perthshire; it was collected in abundance on Ben Lui in June, 1913, and on Meall nan Ptarmachan in 1914, in each locality at about 2500 ft. I am informed by Messrs. J. R. Drummond and R. C. Davie that it is of common occurrence on many of the higher mountains in Scotland. An unnamed specimen of the fungus collected in 1845 in Glen Callater, Aberdeenshire, is preserved in the Herbarium of the Royal Botanic Garden, Edinburgh. It may, therefore, be concluded that this species is widely distributed in Scotland.

In October, 1914, a search was made for the remaining stages, and teleutospores were found in abundance on *Polygonum viviparum* on Ben Lui. Uredospores were not discovered, but this was no doubt due to the late date at which the specimens were collected. *Thalictrum alpinum* occurred in abundance in proximity to the infected plants, but no sign of the æcidial stage was found; it appears that the portions of the host bearing the æcidium die down before the uninfected parts. *Polygonum Bistorta* is not of common occurrence in the vicinity of the infected *T. alpinum*, and it appears probable that this species does not serve as a host for the fungus in these localities.

The following is a translation of Juel's description of the fungus:—

Spermogonia absent. Æcidia amphigenous, on swollen rather extensive dark violet coloured spots, numerous; pseudoperidia widely expanded, revolute. Uredospores hypophyllous, producing pale spots on the upper surface of the leaf, naked, soon becoming pulverulent; spores with echinulate brown wall, contents bright orange, about 20 μ in diameter, germ-pores 3–4. Teleutospores at first developed amongst the uredospores, but later in special dark brown sori, usually hypophyllous, occasionally epiphyllous; spores rather variable, elliptic ovate or pear-shaped, 28–48 $\mu \times 13 \times 23\,\mu$; upper cell thickened at apex with a hyaline papilla of variable size, lower cell with a lateral germ-pore; wall smooth, chestnut-brown; contents colourless; pedicels deciduous.

Æcidia on the leaves and all green parts of *Thalictrum alpinum* in the arctic regions of Greenland and Norway, and in the mountains of Sweden and Switzerland. Uredospores and teleutospores on the leaves of *Polygonum viviparum* up to now only from the Scandinavian mountains; also on *P. Bistorta* by artificial infection.

Two other British species of *Puccinia* produce their teleutospores upon the species of *Polygonum* already mentioned. *P.*

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* Mykologische Beiträge iv. Öfvers af K. Vet-Akad. Förh. No. 6, 1895, p. 379.

Conopodii-Bistortæ Kleb. occurs on *Polygonum Bistorta* and *P. viviparum*, and *P. Polygoni-vivipari* Karst. on *Polygonum viviparum* only. Both these species are at once distinguished from *P. septentrionalis* by the absence of an apical papilla on the teleutospore. *P. Angelicæ-Bistortæ* Kleb., which is not yet recorded for Britain, agrees in the absence of the apical papilla.

Puccinia mammillata Schröt, which has now been split up into *P. Mei-mammillata* Semadini and *P. Angelicæ-mammillata* Kleb. produces its teleutospores on *Polygonum Bistorta*. In this case the apical wall of the teleutospore is unthickened, and the papilla is very small; a similar papilla is found on the lower part of the lower cell beside the pedicel. *P. mammillata* has not been recorded from Britain.

Puccinia Anthoxanthi Fckl.

Puccinia Anthoxanthi has only been occasionally found in Great Britain. It was recorded by Plowright from King's Lynn (Norfolk) in 1884, and specimens have also been obtained from Yorkshire. During the summer of 1914 I collected the uredospore stage of this species on Ben Voirlich (Loch Lomond), and also in the neighbourhood of Ben Lui (Perthshire), and in both these localities it appears to be widespread; no teleutospores were found, although these were searched for in October. The specimens agree with those collected by Plowright in the possession of numerous thick-walled capitate paraphyses in the uredospore sorus. In the original account given by Fuckel (as quoted by Saccardo) there is no mention of these paraphyses, and Sydow's description is similar in this respect. Fischer was unable to find paraphyses in the specimen in Sydow's *Uredineen* (No. 458), but found them in a doubtful specimen on *Anthoxanthum* from Switzerland. McAlpine found none in specimens from Australia, which showed 2–4 very distinct germ-pores on one face of the uredospore.

Sydow states that the species is not uncommon in mid-Germany, and during July, 1914, I was able to collect specimens of the fungus on *Anthoxanthum odoratum* in the neighbourhood of Marburg am Lahn (Hesse). Only the uredospore stage was found, and this agreed exactly with that of the Scottish specimens, the paraphyses being particularly obvious.

In view of the discrepancies as to the occurrence of these paraphyses in the various specimens, a further investigation of the matter appeared desirable. The specimens preserved in the herbarium of the British Museum I have investigated with the following results:—

Specimens from Sydow's *Uredineen* (No. 458).—Uredospores 16–22 × 11–16 μ, usually with 2–3 equatorial germ-pores, but these are not well marked; paraphyses absent. Specimen from Sydow's *Mycotheca marchica* (No. 1218).—Uredospores 25–30 × 16–20 μ, with no clearly marked germ-pores; paraphyses absent; mesospores present. Specimen collected by Fuckel (*Fungi Rhenani*, No. 2427).—Uredospores 20–25 × 17–20 μ, with 2–3 equatorial germ-pores; paraphyses absent.

In all these specimens the teleutospores agree in size and structure with Fuckel's description as given by Saccardo.

In all these the uredospore sori are distinctly larger than those of the specimens recently collected. It seems that this difference in size does not depend on the age of the sorus, since some of the Scottish specimens were collected in June and some in October, and the German specimens in July. It is probable that two forms have been included under *P. Anthoxanthi* as follows :—

(1) Those specimens with no paraphyses in the uredospore sorus—Fuckel, *Fungi Rhenani* (No. 2427), Sydow, *Mycotheca marchica* (No. 1218), Sydow, *Uredineen* (No. 458), McAlpine's Australian specimens.

(2) Those specimens with paraphyses in the uredospore sorus—Plowright's specimens from King's Lynn, Fischer's doubtful specimen from Switzerland, the recently collected specimens from Scotland and Germany.

It must not be forgotten that *P. borealis* produces its uredospore and teleutospore stages on *Anthoxanthum odoratum*, and, judging from Juel's description (see p. 45), this species would be almost indistinguishable from the specimens of *P. Anthoxanthi* from the British Museum which have been just described. *P. borealis* apparently only differs from form 1 in possessing hypophyllous sori, and in the somewhat smaller size of the uredospores.

At present our knowledge of *P. Anthoxanthi* is scanty, and until more facts regarding its life-history are available it would be premature definitely to split up the species.

I wish to express my thanks to the British Museum authorities, and also to Prof. Arthur Meyer who kindly allowed me to make use of the Botanical Department of the University of Marburg for the examination of the German specimens.

Melampsora alpina Juel.

Melampsora alpina occurred on *Salix herbacea* L. on Ben Lui in October, 1914, at about 2500 ft. Both uredospores and teleutospores are present.

The uredospore sori are small, scattered, rounded, amphigenous and orange yellow in colour; spores ellipsoidal or spherical, 19–22 × 14–17 μ, finely echinulate, contents orange yellow; paraphyses abundant, capitate, thick walled, up to 88 μ in length, the head about the same size as the uredospores, wall up to 5 μ in thickness.

The teleutospore sori are amphigenous, rounded, mostly on the upper surface, those on the lower surface being usually smaller and opposite to the larger ones on the upper surface, which are up to ·8 mm. in diameter, brownish black, covered by the epidermis; spores flattened or rounded at the apex, rounded and usually diminishing in size towards the base, 26–50 × 9–14 μ, wall thin, smooth, yellowish-brown.

M. alpina was discovered by Juel in Norway and Sweden, and has been subsequently recorded from Switzerland. It has been

shown that the species is heterœcious, the æcidial stage occurring on *Saxifraga oppositifolia* L. On Ben Lui the diseased *Salix herbacea* was growing in close proximity to *Saxifraga oppositifolia*, but no æcidial stage was discovered; this is not surprising when the date at which the specimens were collected is taken into consideration.

Another species of *Melampsora* (*M. arctica* Rost.) occurs on *Salix herbacea*; this has been recorded from Ben an Dothaidth (a few miles north of Ben Lui) by Mr. Wheldon. This species is also found in Switzerland, Greenland, Norway and Sweden. *M. arctica* appears to differ from *M. alpina* chiefly in the distribution of the sori. The uredospore sori of the former species are described as gregarious, and, according to Juel, often cover the whole shoot. The infected plants are poorly developed, and it appears that the mycelium is perennial. Both uredospore and teleutospore sori are hypophyllous. No æcidial stage belonging to *M. arctica* has been discovered. The uredospore measurements of *M. alpina* given by Juel in his description are 15–18 μ; it will be noticed that the spores of the specimens collected on Ben Lui are larger. Juel also gives the length of the paraphyses in *M. alpina* as 30–35 μ, while those of *M. arctica* reach 50 μ in length. The paraphyses in the present specimens greatly exceed both these measurements, and it seems possible that the length varies with the age of the sorus. In spite of these discrepancies there seems to be little doubt as to the identity of the specimens. Infection experiments are, however, desirable, and it is proposed to carry them out as soon as possible.

SUSSEX RUBI.

By the Rev. W. Moyle Rogers, F.L.S.

The volume of this Journal for 1902 contains (pp. 213–226) a long and interesting paper by the Rev. E. S. Marshall on West Sussex plants. It is supplementary to the first edition (1887) of Dr. Arnold's *Sussex Flora*, and includes a good list of Rubi localities for West Sussex, as known up to 1902. The 1901 and 1906 volumes contain similar lists by Mr. C. E. Salmon for the whole county. The present paper, besides embodying the information drawn from those lists, is an attempt to put on record all available particulars to the present date as to the distribution of Rubi *throughout the county*. This happens to be much easier for me just now owing to my having had the good fortune to spend last July and the first week of August in the Fittleworth and Midhurst neighbourhoods, in mid-Surrey, in company with Mr. L. Cumming and my son (*F. A. R.*) and daughter (*M. A. R.*), who were all zealous observers and collectors of the very numerous Rubi growing over a considerable area in that part of the county. In fact, many of the most interesting records in the following pages are due to their extended

researches. In all such instances the fresh specimens were brought to me; and, as a rule, they will be found entered without the collector's name, like the many others which I actually saw growing *in situ*. In other cases the initials of the collector will be found after the locality given for it (or localities where consecutive), confirmed when I have seen satisfactory specimens by the sign "!." These initials are as follows:—F. = E. H. Farr; G. = E. G. Gilbert; H. = the late T. Hilton; M. = Rev. E. S. Marshall; R. = the late F. C. S. Roper; S. = C. E. Salmon; W. = J. W. White; C. C. B. = C. C. Babington; C. E. B. = C. E. Britton. **E.** and **W.** stand for East and West Sussex respectively.

New records (or what I believe to be such) for v.-c. 13 and 14 are starred. I am much indebted to the Rev. E. S. Marshall and Mr. C. E. Salmon for invaluable help derived from their papers referred to above.

The second edition of the *Sussex Flora* (Simpkin, Marshall & Co., London, 1907) contains a considerable number of the localities given in this paper, and also many additional ones, only a few of which, without voucher specimens, I have thought it well to quote. The nomenclature which I have followed is that of the *London Catalogue of British Plants*, ed. x.

RUBUS IDÆUS L. **W.** Apparently frequent ("both on chalk and sand," *M.*). Observed in several localities near Fittleworth and Midhurst, but usually in small quantity. Woods and downs near Finden, 1901, *W. Whitwell.* No doubt widely, if somewhat thinly, distributed through the county, but perhaps not often reported because regarded by many collectors as mostly sporadic. *Flora Sussex*, however, contains a considerable list of localities.

Var. OBTUSIFOLIUS (Willd.). *__W__. Near Midhurst, *F. A. R.*! The only Sussex example that I have seen.

SUBERECTI.

In the wide sandy districts of mid-Sussex at least—so far as I could see last summer—this is certainly a difficult group, with rather ill-defined specific distinctions.

R. FISSUS Lindl. Apparently uncommon. **W.** St. Leonards Forest, *W.* (1898)! Copse on Duncton Common, *M.* Roadside, Lavington Common. Benham, near Fittleworth. **E.** Near Heathfield Park; High Wood, Bexhill, *R.*!

R. SUBERECTUS Anders. Perhaps rather more frequent than *R. fissus*. **W.** St. Leonards Forest, *W.* (1900)! Copse near Burton Rough; near Petworth Station, *M.*! Fittleworth Common. Near Midhurst. Bignor. **E.** Ashdown Forest, *Borrer* (*teste* C. C. B.). Downland Wood, *F.*! Rocks Wood, Uckfield, *H.*!

R. ROGERSII Linton. **E.** Waterdown Lane, near Tunbridge Wells, *E.*! Apparently this species.

R. SULCATUS Vest. **E.** Near Wych Close, Ashdown Forest, *Waddell* (1904)! Apparently this; but, if so, weak and shade-grown.

R. PLICATUS Wh. & N. So generally distributed that the enumeration of separate localities seems unnecessary. **W**. On most of the sandy common and open moorland, but (in the Fittleworth and Midhurst neighbourhoods at least) mostly represented by a small-leaved and subglabrous form, which in its shining stem and (usually) strongly falcate or hooked panicle-prickles recalls *R. nitidus*, though keeping distinct from it in its roundish-acuminate leaflets and short stamens. In mid-Sussex plants occur which go off from type towards var. *Bertramii* G. Braun in their longer stamens and broad leaflets. There is also a small form, found on Bognor Common by Mr. Cumming, which has very small prickles, compact cylindrical panicle and rather *fissus*-like foliage. At first I was inclined to put this under *R. fissus*; but a careful examination of all the specimens shows that, small as all the prickles are, they are too few in number and too stout-based for that species, while the basal leaflets are not always strictly sessile, and the ripe fruit (Mr. Cumming assures me) is always black.

Var. BERTRAMII G. Braun. To this variety, I think, must go the following:—**W**. Wiggenholt Common, *H.* (1900)! **E**. Washington Common, *H.*! Border of West Dorman's Park, *G.*!

Var. HEMISTEMON (Genev.?). **E**. Halland, Bentley Wood; Fairhazel Brooks, *F.*! By Newick Station, *H.*! Waterdown Lane, *G.*! The *pseudo-hemistemon* of Focke; and probably the *hemistemon* Genev., though not that of Mueller.

SUBRHAMNIFOLII.

R. NITIDUS Wh. & N. **W**. Ambersham Common (between Graffham and Heyshott) 1901! West Chiltington Common, *A. Webster*, 1912! Fittleworth Common and Midhurst Common, 1914; in some quantity, not the type, but a form with broader ovate-acuminate leaflets and a very straggling divaricate panicle, probably not distinct from the form *divaricatus* Focke in spite of the differently shaped leaflets and varying length of stamens. Growing as this Fittleworth and Midhurst plant does in the same localities as a broad-panicled *R. lentiginosus* (which also has stamens of varying length), it can only be distinguished from that after careful examination. I am surprised not to have seen any Sussex *R. opacus* Focke, as it certainly occurs in the three contiguous counties—Hants, Surrey, and Kent.

R. AFFINIS Wh. & N. Apparently rare. **W**. Fittleworth Common, south-west end. **E**. Kemp's Wood border, Little Markly, *R.*! Somewhat resembling *R. affinis*, but on the whole I think still more strongly recalling *R. cariensis* Genev., is a plant which occurs in dense thickets in two or three widely separated spots near Midhurst; but it was too abnormal for definite naming. Thus far typical *cariensis* is only known with us as a western plant—in Ireland and Wales and our south-western peninsula, extending as far east as the neighbourhood of Swanage, Dorset.

R. HOLERYTHROS Focke. **W**. Near Chiltington Common, *W.*!

Woods, Bignor Park, *M.*! **E.** Lane near Eridge, *W. Borrer*, 1845, *Hb. C. C. B.*! Budlett's Common; Park Wood; Maresfield, *F.*! Worth Forest, *C. E. B.*! Waterdown Lane, *G.*! Ashdown Forest, *H.*!

RHAMNIFOLII.

R. IMBRICATUS Hort. **E.** Bexhill. St. Leonards-on-Sea. Waterdown Lane and Tunbridge Wells. It is remarkable that this has not yet been observed in West Sussex, though its general distribution is so predominantly western.

R. CARPINIFOLIUS Wh. & N. Local. **W.** South side of Ambersham Common, *M.* West Chiltington Common and Colgate, *W.*! Midhurst Common and immediate neighbourhood; typical and abundant. **E.** Blackdown, near Uckfield, *F.*!

R. INCURVATUS Bab. Rare. **W.** Rotherbridge, *C. C. B.* (Brit. Rubi). Midhurst Common. Henfield, *Borrer* (Fl. Suss.). Near Midhurst, *F. A. R.*!, not the type, but the strongly marked form (var. *subcarpinifolius* mihi MS.) described by me in this Journal for 1899, 194, and 1903, 90.

R. LINDLEIANUS Lees. Common. **W.** Abundant on the lower greensand from Fittleworth to Midhurst and Pulborough; Stopham; and at least frequent elsewhere; Blackdown (near Haslemere). **E.** Uckfield, *F.*! Terrible Down, *H.*!

R. ARGENTEUS Wh. & N. Local, but often abundant. **W.** Linchmere and neighbourhood, 1900. Blackdown; Lavington; Burton; Graffham. Between Bignor and Madehurst. Patcham Downs, *H.*! **E.** Worth Forest, *C. E. B.*! Waterdown Lane.

R. RHAMNIFOLIUS Wh. & N. Apparently quite generally distributed. **W.** Especially common in the Fittleworth neighbourhood and in the extreme west, about Linchmere, &c. "Near Rudgwick, rare," *W.*! Henfield Common, *H.*! Lavington, Graffham, Heyshott, &c. Near Midhurst. **E.** "Woodmancote and St. Leonards Forest," *C. C. B.* (Brit. Rubi). Waterdown Lane. Budlett's Common, *F.*! Plumpton Green, *H.*!

Var. BAKERI (F. A. Lees). ***W.** Fittleworth to Benham, in several spots, but small quantity. Bognor Common, *M. A. R.*

R. SCHEUTZII Lindeb. ***W.** Near Midhurst, edge of moorland on Petersfield Road. In good quantity and very characteristic. Low growing, and very distinct from the *R. pulcherrimus* in its immediate neighbourhood. Not previously seen in East England except in one locality (Tooting Common) in Surrey.

R. DUMNONIENSIS Bab. Locally abundant. **W.** Between Westerland Farm and Lavington Common, *M.*! Washington Common, *H.*! Midhurst neighbourhood, in several spots. **E.** Hollingbury Camp; Seaford Downs; Hurstmonceaux Park, *H.* Heathfield, *R.*! Waterdown Lane.

R. PULCHERRIMUS Neum. Usually fairly common. Probably distributed throughout the county, as in Great Britain generally; but in some of the more sandy districts it seems rather less frequent than usual. **W.** Greatham Common, *M.*! "Frequent,"

W. Storrington; Rock Common, &c., *H.*! From Linchmere and Shottermill to Midhurst and Pulborough, seen almost everywhere. **E.** Outskirts of St. Leonards Forest, *W.*! Downs, Telscombe; Hurstmonceaux, *H.*! Near Waldron, &c., *R.*! Waterdown Lane; Bexhill.

R. LINDEBERGII P. J. Muell. **W.** Near Rudgwick, *W.*! Apparently this, but not otherwise known in the county.

VILLICAULES.

So far as at present known, quite thinly distributed.

R. MERCICUS Bagnall var. BRACTEATUS Bagnall. **W.** St. Leonards Forest, *W.* (1905)! **E.** Coombe Bank Quarry, near Uckfield, *F.*!

R. VILLICAULIS Koehl., sp. collect. **E.** Harrock's Woods, *Roffey*! Apparently this.

Var. CALVATUS Blox. Petworth; Lavington; Burton.

R. SELMERI Lindeb. Uncommon, or very local. **W.** Midhurst to Elsted, for a short distance. In some plenty on the coast south of Bosham, *M. & S.*!

R. RHOMBIFOLIUS Weihe. Apparently rare. **W.** Near Chiltington Common, *W.* (1898)! Near Midhurst, 1914.

R. GRATUS Focke. **E.** "Uckfield, *F.*" (Fl. Suss.). I have no note of having seen a specimen.

R. LEUCANDRUS Focke. Uncommon, I think, and variable. **W.** Shottermill Common (1900); Fittleworth, Midhurst, and Ambersham Commons.

DISCOLORES.

R. THYRSOIDEUS Wimm. Local. **E.** Hailsham to Hempstead; Ditton's Wood, *R.*! Blackdown Common; Uckfield, *F.*! Near St. Leonards-on-Sea, 1900.

R. GODRONI Lecoc. & Lamotte. Widely distributed as an aggregate; the usual forms coming nearer to var. *robustus* P. J. Muell. than to our West England forms, as described under the name *R. argentatus* P. J. Muell. in Handbk. Brit. Rubi, p. 39. **W.** Wiston, *H.*! Fittleworth and Midhurst neighbourhoods to Benham and Elsted; frequent. **E.** Stanmer Park, *H.*! Coombe Bank Quarry, *F.*!

Var. ROBUSTUS (P. J. Muell.). **W.** Near Petworth Station; Midhurst and Fittleworth neighbourhoods; Bognor Common; frequent. **E.** Near Lindfield; Seaford, *R. S. Standen.* Near Horsted Keynes; Streat to Plumpton Green, *H.*! Waterdown Lane, 1902.

R. RUSTICANUS Merc. So generally distributed as to make full list of known localities unnecessary. **W.** Henfield, *Borrer* (*teste C. C. B.*); same locality, *H.*! Pulborough; Fittleworth, &c. **E.** "Very common in Cuckmere district," *R.* "Very common throughout the county," *Flora Sussex.* Near Tunbridge Wells; Bexhill; St. Leonards-on-Sea.

R. PUBESCENS Weihe var. SUBINERMIS Rogers. Common and quite characteristic. **W**. Henfield, *Borrer* (as "*R. macrophyllus*"), Sowerby Herbarium, British Museum (E. B. Suppl. t. 2525)! Slindon, &c., *M.*! Horsham and St. Leonards Forest, *W.*! Lavington; Coates; Petworth; Midhurst; Fittleworth, &c. Chiefly on moors and other open sunny places. **E**. Uckfield, &c., *F.*! Lindfield, *Standen*! Crowborough Warren, &c., *H.*! Worth Forest, *C. E. B.*! Bexhill, St. Leonards-on-Sea, Battle, &c.

SILVATICI.

R. SILVATICUS Wh. & N. Apparently rare. *__W__. Near Midhurst, on Petersfield Road, in a few spots, 1914.

[R. HESPERIUS Rogers (see Journ. Bot. 1914, 181). *__E__. Near Newick Station, *Rev. J. Roffey*, 1909! Apparently a form of this which I enter here because, though I have seen no other Sussex plant identical with it, Mr. Roffey's specimen strongly recalls a plant growing in Warwick Park, Tunbridge Wells, West Kent (some twelve miles distant); and both seem likely to prove not distinct from the British form of my *R. hesperius* as found in W. Glos. and Carnarvon.]

R. LENTIGINOSUS Lees. Frequent on sandy commons. A form with (as a rule) a remarkably diffuse and straggling panicle. **W**. St. Leonards Forest outskirts, *W.*! Near Lindfield; near 'Sheffield Park Arms,' *Standen*! Petworth; Duncton; Coates, *M.*! Lavington Common, 1901. From Elsted by Midhurst, Selham, and Fittleworth to Pulborough, common, 1914. **E**. Ambersham Common, *H.*, 1907! Tilgate Forest, near Cinder Bank Bridge, *S.* Waterdown Lane. St. Leonards-on-Sea. Recalls the form *divaricatus* Focke of *R. nitidus*, but differing from it considerably in its dull and (at first) hairy stem, large leaves with compound incised teeth, conspicuously hairy and somewhat aciculate and glandular panicle-rachis and pedicels, and its sepals externally hairy and mostly leaf-pointed. Its stem-prickles also are not quite confined to angles and only subequal.

R. MACROPHYLLUS Wh. & N. Type seems rather uncommon. Early records (*Flora Sussex*, &c.) are unreliable because my var. *subinermis* of *R. pubescens* was usually with us mistaken for *macrophyllus* before 1890. **W**. Rudgwick, *W.* By Graffham Down, 1901. Copse near Burton Rough. Midhurst Common. Redhill Hollow, Coates. Benham. **E**. Near Bexhill; Cuckmere district, &c., *R.*! East Chiltington, *H.*!

Var. SCHLECHTENDALII Weihe. **W**. Fairly common, but variable. Henfield, *Borrer* (*teste C. C. B.*). Roadside, Popple Hill, Lavington, *M.*! Bignor. Fittleworth to Benham. **E**. Uckfield, *F.*!

Var. MACROPHYLLOIDES Genev. **W**. Midhurst Common, 1902. In several spots near Midhurst Common, 1914. Like its nearest ally, *R. Schlechtendalii*, variable in density of hairs on stem and panicle, outline of terminal leaflet and size of flowers.

Var. AMPLIFICATUS (Lees). *__W__. Midhurst Common, 1914.

R. Salteri Bab. Very local. **W**. Midhurst Common and between the two railway stations at Midhurst, abundant, 1901. **E**. Alexandra Park, St. Leonards-on-Sea, 1900.

Vestiti.

R. Sprengelii Weihe. Remarkably local. **W**. St. Leonards Forest, *H. & J. Groves*! **E**. Near Tunbridge Wells, *G.*! Heathfield Park; Lane End Common, *H.*!

R. hypoleucus Lefv. & Muell. Uncommon. **W**. Near Crawley, *W.*! Blackdown (near Haslemere). Midhurst Common, abundant. **E**. Budlett's Common, near Uckfield, *F.*!

R. hirtifolius Muell. & Wirtg. **E**. Uckfield, *F.*!

Var. mollissimus Rogers. **E**. Chailey Common, *H.*, 1906!

R. pyramidalis Kalt. Rather local. **W**. Petworth: Burton; Lodsworth, *M.* Shottermill Common, 1900. Graffham. Midhurst. Fittleworth to Benham. **E**. By Heathfield Park wall, *R.*! Fairhazel Brook; Uckfield, *F.*!

R. leucostachys Sm. Generally distributed, and usually abundant. "Alike on chalk, sand, and clay," *M.* The following *leucostachys* hybrids (or what seemed such) were observed by me in **W**. in 1914:—× *pulcherrimus*. Fittleworth to Pulborough. × *rusticanus*. Fittleworth Common and elsewhere. × *sublustris*. Near Midhurst. Henley, *F. A. R.*!

Var. leucanthemus P. J. Muell.? Fittleworth to Pulborough. Bognor Common. **E**. Waterdown Lane, *G.*! Ashdown Forest, *Rev. C. H. Waddell*!

R. lasioclados Focke var. angustifolius Rogers. **W**. Henley, *F. A. R.*! Linchmere to Fernhurst. Near Midhurst.

Var. longus Rogers & Ley. ***E**. Near Allington Farm (? Novington Parish), *Roffey*, 1909!

Egregii.

Rather thinly represented.

R. Boræanus Genev. **W**. St. Leonards Forest, Horsham, *W.*, 1908!

R. cinerosus Rogers. **E**. Fairhazel Brook, *F.*! a form of this.

R. Gelertii Frider. **W**. Henfield, 1901, *H.*! **E**. In good quantity, locally. Woodendean, roadside, 1901; Stanmer Park; wood by Newick Station; downs west of Pangdean; Warren Farm and near Wivelsfield Sation, 1903, *H.*! North Dinchling Common, *Roffey*!

R. anglosaxonicus Gelert. Local; apparently avoiding sandy soil. **W**. Wiston, *H.*! **E**. Uckfield, *F.*!

Var. raduloides Rogers. **W**. Henfield Common, *H.*! apparently this.

Var. setulosus Rogers. **E**. Lane, Streat to Plumpton, 1901, *H.*!

R. infestus Weihe. **W**. Rock Common, *H.*! Apparently a

form of this. **E.** Near Wych Cross, Ashdown Forest, *Waddell*! Waterdown Lane.

R. UNCINATUS P. J. Muell. *__W__. Thicket by pond, near Midhurst, 1914. The only known Sussex locality; which is true also of the next.

R. BORRERI Bell Salt. **W.** Little Bury Wood, Lavington, 1901.

RADULÆ. (Scarce.)

R. RADULA Weihe. **W.** Between Slinford and Lower Broadbridge, *W.*! The only Sussex locality *for the segregate* for which I can vouch. Those which follow (for **E.**) seem to belong to it, but are more or less doubtful. **E.** Near Polegate; Sidley Woods, *R.*! Near St. Leonards-on-Sea.

Var. ANGLICANUS Rogers. Apparently uncommon. **W.** Near Bosham, 1901; Lodsworth, *M.*! Bognor Common. Near Midhurst by 'Shamrock Inn,' Bepton Road, *F. A. R.*! apparently this. **E.** Piltdown, 1902, *Standen*. Near Uckfield, *F.*!

Var. ECHINATOIDES Rogers. **W.** Coates to Burton, 1902. **E.** Near St. Leonards-on-Sea, abundant.

R. ECHINATUS Lindl. Certainly one of the most widely distributed of Sussex Rubi, and locally abundant. **W.** Near Rudgwick Church, abundant, *W.* Shottermill Common, 1900. From Graffham and Lavington to Midhurst and Fittleworth, very frequent. **E.** Race Hill, Brighton, *H.*!

R. RUDIS Wh. & N. **W.** Abundant, especially on roadside banks. Henfield Common and neighbourhood, *H.*! Slinford; Midhurst, *W.*! Near Petworth Station and between it and Fittleworth, and thence to Benham. Midhurst Common and neighbourhood. **E.** Ashdown Forest, north of Wychgate, *Linton*!

R. NEWBOULDII Rogers, Journ. Bot. 1905, 364. **E.** Waterdown Lane, 1902.

(To be concluded.)

TWO VERBESINAS.

By S. F. BLAKE, A.M.

Verbesina densifolia, n. sp. Frutex ± resinifera sect. *Saubinetiæ*; ramis alternis brunneo-griseis crassis (ca. 4 mm. dimetente) striatis juventate subappresse piloso-hirsutis ætate densissime tuberculatis pilorum basibus persistentibus; foliis alternis proximis (internodiis 3·5–8 mm. longis) crassulis rigidis flavoviridibus sessilibus non amplectentibus penninerviis (venis lateralibus 6–7-jugis) supra dense strigillosis ætate scabris basibus persistentibus tuberculatis pilorum subtus tuberculato-strigillosis et venas secundum subpilosis 4·6–6·5 cm. longis 1·8–4 cm. latis, lamina late obovata vel suborbiculari-obovata abrupte acuta mucronata supra medium leviter repando-serrata (dentibus 7–13-jugis calloso-tuberculatis) in basin integram cuneatam angustata;

capitulis cymoso-paniculatis in pedunculis axillaribus et terminalibus 5–15-cephalis folia paullo superantibus; pedunculis et pediculis (6–18 mm. longis) dense sordide pilosis ± glandulosis; disco frugifero 6·5–7·5 mm. alto 9–11 mm. dimetente; involucri 2–3-seriati 6 mm. alti squamis subæqualibus oblongis vel oblongo-lanceolatis obtusis sordide pubescentibus; radiis fertilibus flavis (?) ca. 10 ovalibus bidentatis dorso pubescentibus 3–4 mm. longis 1·3–2·1 mm. latis; corollis disci flavis et infra et in venis et dentibus strigillosis 4 mm. longis (tubulo 1 mm.), fauce vix ampliata; paleis acuminatis sursum sparse pubescentibus 5·5–6 mm. longis; acheniis radii triangularibus non alatis pubescentibus 1-aristatis; disci griseis compressis oblongo-ovatis tuberculato-strigillosis e apice pæne ad basin anguste alatis (alis ca. 0·3 mm. latis albidis ciliolatis) in faciebus uninerviis 4 mm. longis 1·6 mm. latis, interdum non alatis; aristis rectis minute strigillosis æqualibus vel inæqualibus 2–3 mm. longis.—COLUMBIA: 1842–3, *Linden* 1335 (types in Brit. Mus. and Kew Herb.).—Not very closely related to any described species.

VERBESINA ARBORESCENS (Mill.) n. comb.—*Silphium arborescens* Mill. Gardn. Dict. ed. 8 no. 4 (1768). *Verbesina olivacea* Klatt, Leopoldina xx. 93 (1884). *Otopappus olivaceus* Klatt, Ann. Naturh. Hofmus. Wien, ix. 362 (1894). For further synonymy see Robinson and Greenman, Proc. Am. Acad. xxxiv. 557 (1899).

The type specimens of Miller's *Silphium arborescens* in the British Museum, collected in Vera Cruz by Houstoun in 1731, prove to be identical with *Verbesina olivacea* Klatt, described from material in the Berlin Herbarium collected by Schiede (number 340) at Hacienda de la Laguna, Vera Cruz. Klatt's short description may be amplified by the following drawn from the Houstoun specimens.

Frutescent, erect, "10 or 12 ft. high, much branched" (Houstoun MSS.); branches dull brown, striatulate, puberulent, bearing 6–10 heads on terminal and axillary 1–4 headed peduncles; leaves alternate, subrhombic-ovate, broadest at the middle, acuminate at both ends, serrate from apex three-quarters to the base with about twenty pairs of mucronate depressed teeth, strigillose above, densely lepidote in age with the persistent tuberculate bases of the hairs, below rather densely pubescent with short subappressed grayish hairs, the veins (about eleven pairs) almost tomentulose, 8·5–11·5 cm. long, 3·3–4·3 cm. wide, gradually narrowed into unmargined petioles 5·5–6·5 mm. long; peduncles subtomentulose, ± glabrate in age, 3·2–8·5 cm. long; involucre triseriate, slightly graduated, 6–7·5 mm. long, the scales oblong, obtuse, greenish and striate, ciliate on margin, slightly pubescent or subglabrate on back; disk in fruit 11–15 mm. thick, 6·5–9 mm. high; (rays yellow, oblong, about 18, 5-6 mm. long, 1·3 mm. wide [*Purpus* " =2179"]; (disk flowers numerous, yellow, with a few loose hairs below, 4 mm. long (the slender tube 1·1 mm. long); pales scarious, thin, pointed, with a narrow green keel, the apex minutely erose and puberulent, 8 mm. long; disk-achenes very

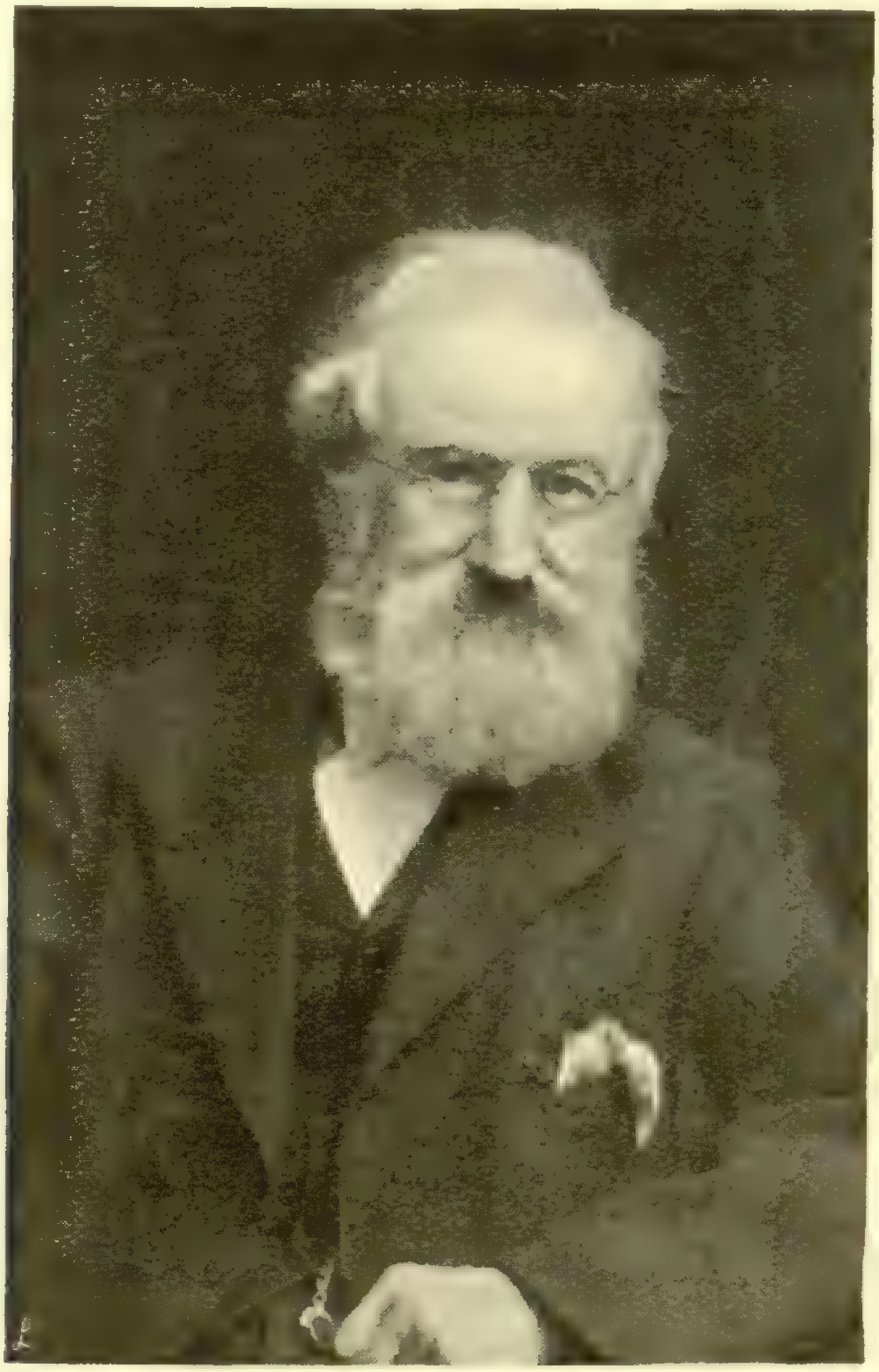
flat, the glabrous black body one-nerved on the sides, 4–4·5 mm. long, 1·5 mm. wide, the whitish chartaceous wings ciliolate, very narrow or as much as 1 mm. broad, running from base to apex of the achene, one or both adnate to the short (0·7–2 mm.) unequal or obsolescent awns for about 1 mm. of their length, in the manner of *Otopappus*.—VERA CRUZ: 1731, *Houstoun* (types in Brit. Mus.); rocky slopes, Zacuapan, September, 1908, *Furpus* " =2179" (Brit. Mus.).

MORDECAI CUBITT COOKE.
(1825–1914.)

MORDECAI CUBITT COOKE was born at Horning, Norfolk, on July 12th, 1825. His father, Mordecai Cooke, had been a middleman in the bombazine trade, but when the manufacture of this material declined he started a shop which, being the only one in the village, dealt in everything needed by a rural people. His wife, Mary Cubitt, was the daughter of the village schoolmaster of Neatishead. Mordecai is a family name dating back to the seventeenth century: there is a tradition that it originated some time in the fifteenth century, when the Cooke of that day married a Jewess, who gave her children the names Mordecai and Rebecca. Cooke's first school was a dame's school, which he attended until he was nine years of age; the dame was assisted by a niece who was an excellent penwoman, and it was to her tuition that Cooke owed the bold flowing hand so familiar to mycologists. It was from his mother that Cooke had his introduction to botany, for as a child he collected flowers with her in the Norfolk lanes. In 1834 he left the dame's school and was sent to Ilford to be educated by his uncle, the Rev. James Cubitt, a nonconformist minister who afterwards became classical tutor at Spurgeon's College. In a presidential address to the Hackney Microscopical Society in 1887 Cooke said:—"This jubilee year of Her Majesty's reign reminds me that I began the study of botany before that reign commenced. I cannot say that I proceeded very far in the study of plants during the reign of William IV., but I was in the habit of going periodically into the lanes and fields to collect flowers, and on my return home did my best, by pulling them in pieces, with Macgillivray's edition of Withering's Botany before me, as my only guide, to discover their names and places. It was dry work in those days, and all the methods were of the driest and most mechanical."

In 1838 Cooke returned to Norfolk and was sent along with his brother, who still lives, to a school at Neatishead kept by one William Moore. His education here was peculiar. In addition to pedagogy, Moore did land surveying; Cooke accompanied him, and worked out the results during school hours. At the age of fifteen Cooke was apprenticed to a wholesale drapery establishment at Norwich. The draper was an amateur ornithologist, and Cooke began to take an interest in bird life, and made a fine collection of water-colour drawings of birds. The drapery

business did not attract him; but at this time he learnt to play on wind instruments, on most of which he became more or less proficient. At the age of twenty Cooke left Norfolk and returned to London to live with a second uncle, William Cubitt, a keen Baptist minister and a manufacturer of velvet and coach trimmings; he found occupation as a copying clerk in a solicitor's office, but in 1847 had a serious illness and lost his situation.



About this time he turned his attention to literature: we find him publishing, at $4\frac{1}{2}d.$ each, verses with such titles as "The Struggle for Freedom," "Flight of Thought," "Course of Love," &c. He later became an usher in a school at Birmingham, and also lectured on poets and poetry.

About this time came Cooke's introduction to fungi. "It was my good fortune to be introduced to an East Anglian gentleman who resided in a small agricultural village not ten miles from Norwich. I had been invited to give a gossiping lecture to the rustics in the schoolroom, and was asked to take a preliminary tea with the squire. It soon became manifest that the hobby of my host was 'edible fungi,' a subject of which I was then profoundly ignorant, but I became greatly interested in the

discovery that there were other fungi beside the mushroom which might be eaten, and I had the pleasure of looking over his portfolio of coloured drawings, and hearing his explanations and encomiums. This was my first inspiration to turn my attention to 'toadstools.' I had never seen them before, or at least with an appreciative eye, and the subject came upon me as a revelation. At first I, as so many others have done, restricted my interest to their edible qualities, and had no ambition beyond being able to recognize, collect, and devour some half-dozen different kinds of 'toadstools,' which, in all my surroundings, I had been taught to regard as 'rank pi'sen.' Since that eventful evening I have never abandoned the pursuit, and it has been my solace" (*Grevillea*, xix. (1891), p. 68).

In 1849 we find Cooke editing a *Monthly Repository of General Literature*; he wrote the whole of this short-lived periodical under various names or permutations and combinations of his initials. At the end of this year he made himself acquainted with the Pestalozzian system of educating infants, and successfully replied to an advertisement for a master to open the new Trinity School at Lambeth, under the old National School system. Here he remained ten years, applying himself with his customary vigour to his occupation. In addition to his ordinary teaching he held evening classes on numerous subjects, and wrote for some of the educational journals. He began a museum of economic products and gave lessons on economic botany, led thereto principally by the writings of Peter Lund Simmonds (1844–97). One branch of this study related to Indian food products, of which he acquired a fairly good knowledge. He used to visit brokers in Mark Lane and Mincing Lane for the purpose of obtaining samples of any new or interesting products which came into the market, and entered as a student in the Science and Art Department at South Kensington, where he studied structural and systematic botany and drawing. Subsequently he conducted botanical classes under the Science and Art Department, of which he was the first certificated teacher.

In 1860 another clergyman was appointed to Trinity Church who considered Cooke's evening lectures unnecessary and his botanical activities waste of time; Cooke thereupon resigned his post, and sold his museum for £100. In this year he published his first volume, *The Seven Sisters of Sleep*, a popular history of the principal narcotics of the world; in this he is described as "Director of the Metropolitan Scholastic Museum." About this time he was connected with Twining's Economic Museum at Twickenham and gave botanical lectures to the gardeners and others employed by Baroness Burdett-Coutts at Holly Lodge, Highgate.

In 1861 Cooke, on Simmonds's recommendation, was engaged to compile the catalogue of the Indian exhibits at the great exhibition of 1862. Here he got to know Dr. Forbes Watson, chief of the Indian Museum, where, after completing a similar work for the Commissioners, he arranged and stored the raw products. He remained there until the Museum was abolished in 1880.

When conducting his botanical classes in the late fifties, Cooke sometimes took his pupils for country rambles in order to give them practical demonstrations on wild flowers, and some of his former pupils subsequently constituted themselves into a small society. This, the Society of Amateur Botanists, founded in 1862, was "established for mutual assistance in the study of British plants, by organised excursions into the country, the interchange of specimens, the communication of papers, and the establishment of a library, herbarium and museum"; of it Cooke was the first and only President. Excursions were held during the summer on alternate Saturday afternoons, and fortnightly meetings on Wednesday evenings. According to Mr. W. G. Smith,* Cooke at that time had noticed the fungi but little; he collected and studied the microfungi and was very keen on all animate subjects: he captured toads, frogs, newts and snakes. He was an inveterate smoker, and when he was not pulling at his pipe he was singing. The Society at one time numbered about fifty members, and its meetings and excursions were well attended. Some of the papers read at the meetings were published in this Journal or in the *Botanist's Chronicle*. W. W. Newbould, then an active force in promoting the study of British botany, was one of the members, among whom were some whose names have become familiar in the botanical world—W. T. T. Dyer, W. G. Smith, H. Trimen and the Editor of this Journal—and others less well-known, among them A. B. Cole, James Collins, Harland Coultas, A. Grugeon, Robert Hardwicke, James Irvine, T. Ketteringham, and W. W. Reeves: Berthold Seemann and Boswell Syme were occasional visitors. The meetings were first held at a club in the Euston Road, but afterwards in a room over Hardwicke's shop, 192 Piccadilly.

Hardwicke was, at this time, a successful publisher of Natural History books, *e.g.* the third edition of *English Botany* and the *Popular Science Review*. Cooke suggested to Hardwicke that there was a good opening for a cheap monthly magazine devoted to natural history and microscopy offering facilities for exchanges and copious notes and queries: this idea took shape in *Hardwicke's Science Gossip* under Cooke's editorship, the first number of which appeared January 1st, 1865. It at once became a success, and for a long time was the only cheap journal of Natural History. In May it contained a letter suggesting the formation of an association amongst amateur microscopists which would be of greater service to them than the older and more pretentious Royal Microscopical Society. The suggestion fell on fertile ground, and mainly through the efforts of Cooke, the Quekett Microscopical Club was formed. Cooke was one of the two vice-presidents, and to the first number of the club journal contributed a paper "On Universal Microscopic Admeasurement," in which he suggested the universal adoption of the French metric system for microscopic measurement, a suggestion which was

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* Gard. Chron. 1914, ii. 356.

soon taken up by microscopists. Many of the "Amateur Botanists" joined the Quekett Club, and the older society dwindled and finally ceased to exist.

During this period Cooke was also energetic in other directions. While working for his Science and Art examinations he had realised the need for some simple text-book on botany for students, and this led him to write his *Manual of Structural Botany*, which was published in 1861 and was a great success. The book went through numerous editions, but Cooke had sold the copyright for £5. In the following year he published a *Manual of Botanic Terms* and his *Plain and Easy Account of British Fungi*, illustrated by twenty coloured plates, in which are described several of the larger fungi and methods of cooking the edible ones. The plates were lithographed by Cooke's youngest brother, E. Cooke, who was apprenticed to a lithographer and afterwards became an art master. This was the first book that treated fungi in a popular manner.

Cooke now began to aspire to a real knowledge of fungi. He entered into correspondence with the two most eminent British mycologists of that date, M. J. Berkeley and C. E. Broome, and obtained their help in many ways. His energy soon bore fruit, and in the first volume of this Journal (1863) he published a paper on "Rare or New Hymenomycetal Fungi," with a coloured plate: three papers on microfungi appeared in 1864 and others followed in succeeding volumes up to and including 1870. In 1863 appeared his *Index Fungorum Britannicorum*, a complete list of fungi found in the British Isles to that date, arranged so as to be applicable either as a check-list or for herbarium labels: several papers on microscopic fungi were written for the *Popular Science Review* during 1863–4, and these were revised and expanded to form the well-known volume entitled *Rust, Smut, Mildew and Mould*: this introduction to the study of microscopic fungi, which was illustrated by J. E. Sowerby, is still used, and is probably the best of Cooke's popular books. Another useful work was his *Easy Guide to the Hepaticæ*, reprinted from the first volume of *Science Gossip*, with which it had been issued: in 1867 he published his not very satisfactory *Fern Book for Everybody*. In 1871 his *Handbook of British Fungi* was published in two volumes.

Cooke had been publishing *Fungi Britannici Exsiccati* since 1865, and continued to do so until 1879; meanwhile he had arranged the fungi in the British Museum and at the Edinburgh Gardens. The *Handbook* was an immediate success. The prospectus had asked for subscribers at half-a-guinea, but the work extended from the six hundred pages promised to more than nine hundred, and from two hundred figures to upwards of four hundred. The *Handbook* raised the number of British fungi to 2810—a great advance on the estimate in Berkeley's *Outlines of British Fungology*, published in 1860. The book is on traditional lines, and is the last complete English fungus flora: in the preface the author says: "Pursuing the study of fungi as a recreation in the intervals

of the daily business of life, it was no easy task to prepare and arrange the descriptions of nearly three thousand plants, compare specimens and figures, and measure their spores." The publication of the *Handbook* had another effect. Hardwicke, who had published much of Cooke's work, resented the omission to offer him this, and Cooke retired from the editorship of *Science Gossip*, and immediately began the cryptogamic periodical *Grevillea*, which he conducted for twenty years (1872–1892). This was at first issued monthly, but after two volumes, by which time it had obtained a wide circulation at home and abroad, it became a quarterly. Cooke wrote most of it, though he had contributions from the majority of the leading cryptogamists.

In 1875 Cooke published in the International Science Series, *Fungi: their Nature, Influence, and Uses*. This work, which clearly shows his all-round and detailed knowledge, was afterwards translated into French; it was almost his only book to prove a commercial success, something like £300 coming to him in royalties. Early in this year he wrote to Berkeley: "It seems an endless task to reconcile the species published by different authorities—hence I think it would be a good piece of work if I could publish coloured figures of all the species possible of *Peziza*, clearing up as much as I can, and giving authorities for all the specimens figured." This work he began to publish in the same year under the title *Mycographia*, or "Figures of Fungi from all Parts of the World." It went on until 1879, during which time only the fleshy Discomycetes had been attempted; four hundred and six coloured figures and descriptions were published. Many figures had been prepared, but the lack of subscribers caused the cessation of the publication. In this year Rostafinski published in Polish a monograph on the Mycetozoa. Cooke procured a Polish dictionary, made out those parts which he considered relevant to this country, and published it in 1877 as *The Myxomycetes of Great Britain*. The following year appeared *Clavis Hymenomycetum*, written in collaboration with the French mycologist, L. Quélet, in which was given a synopsis in Latin of all known European Hymenomycetes.

During this period Cooke was engaged at the India Museum: here he prepared lists and catalogues as well as papers on subjects connected with economic botany and pharmacy. In 1880 the Museum was dissolved and the entire economico-botanical collections were handed over to the Royal Gardens, Kew, the India Office undertaking to pay all the expenses of removal, to expend a sum not exceeding £2000 in an extension of accommodation at Kew, to make a grant of £200 a year for the efficient maintenance of the Indian collections, and to place Cooke's services at the disposal of the establishment three days a week for a period of five years. Besides being at hand to give information in respect to the Indian collections, Cooke undertook the re-arrangement of the collection of Thallophytes in the Herbarium, as well as the duty of reporting upon questions connected with plant-diseases produced by fungoid organisms which were submitted to Kew.

In 1881 Cooke had a serious attack of paralysis, which stopped his work for six months; in that year was published a popular *résumé* of Darwin's writings for the S.P.C.K. under the title *Freaks and Marvels of Plant-Life.* In the same year also appeared the first part of the work with which Cooke's name will always be associated, the *Illustrations of British Fungi.* He had long cherished the idea of publishing such a work, and to this end had collected drawings of the rarer species from all the leading British mycologists. This is the largest and most complete book of its kind ever produced, containing 1200 coloured plates: it appeared in seventy-six parts, and occupied ten years in publication. He was prepared to continue the work by including the whole of the Basidiomycetes, but sufficient subscribers to secure him against pecuniary loss were not forthcoming.

During these years, although having much else to do, Cooke, in addition to writing popular books on Natural History, turned his attention to freshwater algæ, but his three publications, *British Freshwater Algæ* (1882–4), *British Desmids* (1887), and *Introduction to Freshwater Algæ* (1890), were far from satisfactory. An excellent account of *British Edible Fungi* appeared in 1891 as well as his large *Handbook of Australian Fungi.* In 1892 he published a popular volume giving an excellent account of entomogenous fungi—*Vegetable Wasps and Plant Worms.* At the end of the year Cooke retired from Kew, having reached the age limit, and also from the editorship of *Grevillea*, although he continued to contribute to its pages for the two years during which it continued to appear with Mr. G. Massee as editor.

Cooke continued to write articles in various periodicals until 1908. His remaining volumes are:—*Handbook of British Hepaticæ* (1895), which did not add to his reputation; *Introduction to the Study of Fungi* (1895), a book on similar lines to his volume of 1872; and *Fungoid Pests of Cultivated Plants* (1906), an excellent account of plant diseases, which had appeared as a series of papers in the *Journal of the Royal Horticultural Society.* His last work on fungi was a *Catalogue and Field-book of British Basidiomycetes* (1910): this was a list of species published as a protest against the present method of writing the names of authorities for species. Though advertised as being "in a convenient pocket size and form," its inconvenient size and shape effectually prevented its use in the field. He left a manuscript dealing with edible and poisonous British fungi, illustrated principally from his *Illustrations.* During this period Cooke, as "Uncle Matt," wrote books on wild flowers for the young.

No account of Cooke's career can be considered complete without some reference to his activities in the field. For a number of years he acted as leader at fungus "forays" all over the country. The forays originated with the Woolhope Club in 1867. The scope of the Woolhope foray, which at first was only that of collecting fungi suitable for the dinner, was speedily extended until it included all fungi. The forays continued until 1892. Cooke appears to have paid his first visit in 1871. His

geniality and wit, as well as his special liking for edible fungi, soon made him one of the leading members. He usually read a paper at the meeting; often this was a humorous contribution, and sometimes he indulged in his old habit of verse-making.

In the later years of his life Cooke had serious trouble with his eyes. He had suffered more or less from dyspepsia all his life, and his fondness for patent medicines probably made matters worse. Strange as it may seem, he was not fond of the open air, to which he much preferred a pipe and a book, or a theatre. In appearance he was rather slender, with a keen, alert look, red hair and beard, and not over careful of his personal appearance. Probably having forgotten his "Struggle for Freedom" he was as conservative in politics as he was in science: in the one he was a prominent member of the Primrose League, and in the other he was content to follow the Friesian tradition as expounded by Berkeley, and opposed with all the strength of a vigorous pen the doctrines of lichen symbiosis and heterœcism. "As for my friends, they may rest assured that when I have shuffled off this mortal coil they will be able to say, with confidence, that amidst all my follies and crimes, I was never the advocate of the theories of Table-turning, Tichborne or Schwendener"! Unable to read, he was still of clear mind, and liked nothing better than that his daughter should read to him popular articles on science when written by authoritative pens. He was particularly interested in those of Sir Ray Lankester, whom he remembered as a boy in a short Eton jacket, frequenting Hardwicke's shop in company with his father.

A year or two before his death Cooke underwent an experience in which he had been anticipated by Charles Darwin and "Mark Twain." An interview which he gave the *Morning Post* on his eighty-seventh birthday led to the report of his death, which received currency in a note in this Journal. This was followed by a notice in the *Kew Bulletin* (1912, p. 369) the writer of which, Mr. George Massee, spoke cordially of the help which Cooke had always given him, and added a touch of *vraisemblance* to the statement by saying that "he peacefully passed away at his residence." Echoing "Mark Twain," Cooke said that the report was "much exaggerated."

But his strength began to fail now at an increased rate. In January, 1914, he left London and went to live with a married daughter at East Southsea. At first he was much better for the change, but after a short time heart attacks set in, to one of which he succumbed on November 12th; he was buried at Finchley on November 17th.

In all, Cooke wrote about three hundred and fifty papers and books in connection with mycology. His herbarium of 46,000 specimens was purchased by Kew, where is also his collection of 6000 drawings, many unpublished.

Cooke received many honours. Having done much for American mycology, he received the honorary degrees of M.A.

(St. Lawrence, 1870; Yale, 1873), and LL.D. (New York, 1874), and was honorary member of many American societies. In this country he was elected Associate of the Linnean Society in 1877, and received the Linnean Gold Medal in 1903. He was made V.M.H. in 1902, and was an honorary member of most of the British Natural History Societies. Saccardo dedicated the genus *Cookella* to him, and upwards of thirty species of fungi have been named after him by various botanists.

I am indebted to Miss Leila A. Cooke for much help in drawing up this notice. The accompanying portrait I owe to the courtesy of the *Gardeners' Chronicle.*

J. Ramsbottom.

BIBLIOGRAPHICAL NOTES.

LIX.—A Bibliographical Puzzle.

While engaged in collating the first and second editions of Lee's *Introduction to Botany* for a correspondent, I have come upon something which I am not able to explain. The second edition differs from the first, mainly in its having a glossary, and it is this glossary which puzzles me.

The first edition was published in 1760, and was followed in 1765 by the second. The title pages are practically the same, except we have, after "the second edition," this phrase "to which is added A Glossary." The body of the work runs from page 1 to 332, the last four pages constituting signature Z. Next follow twelve plates, with as many corresponding leaves of explanation, without pagination. After plate 12 we come to "A Glossary; explaining the technical terms in Botany: in alphabetical order." Here comes the curious point; the signature, instead of being as we should suspect, 2 A, A A, or A a, is actually G g, and the first page is actually 449. How came this gap? If we allow the utmost of 24 pages for the leaves facing the plates, the first page of the Glossary should be 357 (333 + 24 = 357), but is in fact 92 pages ahead, without a hint of any peculiarity.

I have failed up to now to find an English book from which this Glossary could have been taken bodily. Between the issue of the first edition of Linnæus's *Species Plantarum* in 1753, and the publication of this Glossary, we have only a dozen years, and so far I cannot assign this as belonging to any work by T. Martyn, J. Hill, Stillingfleet or Wilson, assuming, as the signature and pagination lead us to suppose, that this part of Lee's book was printed from the formes belonging to some other book.

The last two paragraphs of the preface may throw a little light upon the matter:—

"The *Glossary*, which is an Addition to this Work, contains many new Terms of Art, not in the former Edition, collected from the Works of Dr. *Linnæus*, that have been published since the Introduction to Botany made its first Appearance. Notwithstanding the greatest Part of these Terms are explained in the

Body of the Work, yet there remained some Difficulty to the Learner, who could not so readily find the Explanation of a Word where they are drawn up, in a scientific Order, as by an alphabetical List. The whole Work is corrected and enlarged by an Addition of all the new Genera, collected from the last Edition of the *Genera Plantarum*.

"To the Memory of a late ingenious and worthy Gentleman, the Author with Gratitude acknowledges the great Obligations he owed him, in putting the Materials of the first Plan of this Work into a proper Form; and would willingly have informed the Public to whom he was obliged, had he not been prohibited, while that Gentleman was living, from mentioning his Name; and as it is uncertain how the surviving Relations of that worthy Gentleman would like to see his Name mentioned in a Work of this kind, Prudence bids him be silent."

Who was this "ingenious and worthy Gentleman"? Sir J. E. Smith states (Engl. Fl. i. p. xii.) that Lady Ann Monson helped Lee; had the latter another helper? Could he have intended to bring out an introductory volume himself, but suppressed it in favour of Lee, merely contributing the glossary?

These are questions which I cannot answer; but I hope some one may be able to solve these problems.

B. Daydon Jackson.

LX.—Who was Dr. Bonham?

Parkinson's *Theatrum Botanicum* (1640) is stated on its title-page to contain "the chiefe notes of Dr. Lobel, Dr. Bonham, and others." I do not recall any specific mention of Dr. Bonham in the body of the work; and, though this title-page, with his name, is quoted by Pulteney,* and referred to by the late Prof. J. Reynolds Green,† they give no information as to Dr. Bonham, nor does his name occur in Dr. Munk's *Roll of the Royal College of Physicians* nor in the *Biographical Index of British Botanists*. On the other hand, Parkinson makes great—and to some extent acknowledged—use of the work of Caspar Bauhin. As Pulteney says,‡ the *Pinax* is practically incorporated in the *Theatrum*—a circumstance which probably largely led to Ray's systematic citation of Parkinson's book. It occurs to me, therefore, that the "Bonham" of the title-page may be merely a misprint for "Bauhin," which may well have escaped the eye of the author of the *Theatrum*, who was seventy-three years of age in the year in which it was published.

There was a Dr. Bonham, however, whose name occurs in Foster's *Alumni Oxonienses*, and in the *Dictionary of National Biography* (vol. v.). Thomas Bonham, it appears, was educated at St. John's College, Cambridge; graduated as B.A. in 1584, and

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* *Sketches of the Progress of Botany*, i. 144.
† *History of Botany in the United Kingdom*, pp. 51, 60.
‡ *Op. cit.* p. 149.

was incorporated as M.D. at Oxford in 1611. He practised in London, apparently as a barber-surgeon, and died about 1629—the year of the publication of Parkinson's *Paradisus*—leaving all his manuscripts to his servant, Edward Poeton, Licentiate in Chirurgery. Poeton took up his residence at Petworth, whence, in 1630, he published *The Chyrurgians Closet or Antidotarie Chyrurgicall.* This little quarto volume consists entirely of medical prescriptions grouped under alphabetical headings, such as "Balms, Cataplasms, Synapisms, Oyles, Unguents," &c., with nothing of a botanical nature; nor can I trace these recipes in Parkinson's book.

This inquiry is, however, chiefly incidental to another and a wider question, *viz.* to whom is the learning of the *Theatrum* to be credited? The author, as Pulteney says (*l.c.*), "has extracted largely from Clusius's 'Exotics,' from D'Acosta, Monardes, and Garcias *ab* Horto," *i.e.* from Clusius's various abridgements; and, though Pulteney only speaks (p. 105) of some of Lobel's papers falling into Parkinson's hands, and being incorporated in his work, we cannot ignore the precise statement made by How * that he had seen the unpublished "volumes" of the work that had occupied the last forty years of Lobel's life, "compleat, The Title! Epistle! and Diploma affix'd!"

It seems more likely that the extracts from Clusius were the work of one who had lived for years on terms of intimacy with him in Flanders, rather than that of the old apothecary of Long Acre; whilst Parkinson's statement †—"he prevented by death failing to performe it I have, by purchasing his Works with my Money here supplied"—seems only comparable to Gerard's effrontery in dismissing Dr. Priest's translation of Dodoens with the disingenuous remark ‡ that the man being dead, his work had perished with him.

I am inclined to think that both Gerard's *Herball* of 1597, and Parkinson's *Theatrum* of 1640 owed most of their appearances of learning in description and synonymy to one and the same botanist, *viz.* Matthias de Lobel.

G. S. Boulger.

SHORT NOTES.

Note on Hypericum calycinum L.—In *English Botany*, t. 2017 (May 1, 1809), Smith writes: "We add to our Flora another *Hypericum* without the least scruple." This was *H. calycinum* L., which had been found by James Drummond in great abundance between Cork and Bandon, and was considered by him and by Smith "perfectly wild." The plant is, of course, abundantly naturalized in many localities in the three kingdoms; but the earliest record of its occurrence will be found in a letter from Samuel Brewer to Sloane, written at Bradford, January 10, 1730, and preserved in Sloane MSS. 4051, f. 166, as follows: "As

---

* Lobel, *Stirpium Illustrationes* (1655), pp. 164–5.
† *Theatrum*, p. 1060.
‡ Preface to the *Herball* (1597).

I was the last summer chasing of butterflies, seeing a fair plant of *Androsæmum vulgare* Park. 1575 [*H. Androsæmum* L.] I took a specimen of it. An old man standing by told me, pointing, if I wanted such hearbs as that, goe up into the wood upon that mountain and you may see an acer [acre] of it covered. Say you so, quoth I, because I never saw above a plant or two in a place: I will goe up and see y^{m}. When I came up I never was more agreeably surprised by finding it to be S^{r} George Wheelers Ascyrum in full flower and a glorious golding show it was. There were several hundreds of y^{m} but not an acer covered. There are old people in the neighbourhood y^{t} remember it to be there this 60 years and more and known there by [the name of] the yellow Rose." *H. calycinum* is stated by Aiton (Hort. Kew. iii. 103) to have been introduced in 1676 by Sir George Wheler (1650–1724), who found it in the neighbourhood of Constantinople and described and figured it in his account of his journey into Greece (p. 205) as *Androsæmum constantinopolitanum flore maximo*. The memory of the "old people" of Bradford must therefore be at fault, as of course often happens in such cases. Ray (Hist. Pl. ii. 1017) cites as a synonym *Ascyroides cretica major* Park. (Theatr. 574, 1618 (fig.), 1640), but this identification is at least doubtful. Morison, who according to Ray grew the plant in the Oxford Garden from seeds received from Wheeler, figures and describes it in Hist. Pl. Oxon. ii. 472, sect. 5, tab. 35, fig. 2; but his description, according to Smith (*l. c.*), is "a miserable mass of error."—James Britten.

Alchemilla.—Mr. Druce has called my attention to the fact that the determinations of both the Nant Francon and Linlithgow specimens which he lent me, and which are referred to in Journ. Bot. 1914, p. 288, were made by Dr. Ostenfeld.—C. E. Salmon.

A Correction.—In Journ. Bot., 1914, p. 129, I recorded *Trifolium ochroleucon* as a Middlesex casual. This was an error; the plants in question have since been identified at Kew as *Trifolium albidum* Retz.—J. E. Cooper.

REVIEW.

Trees and Shrubs Hardy in the British Isles. By W. J. Bean, Assistant Curator, Royal Botanic Gardens, Kew. Two volumes. 8vo. 1440 pp. With over 250 line drawings and 64 half-tone illustrations. John Murray. Price £2 2*s.* net.

It is long since we met with a book as well planned and as well carried out as this. It is intended, as the preface states, not for the botanist but for "amateurs, country gentlemen, and landowners, nurserymen, park superintendents, and professional gardeners." It is neither as bulky nor as costly as the *Arboretum et Fruticetum Britannicum*, by the publication of which Loudon ruined himself seventy-seven years ago, and with which it ventures to invite comparison; but though it has not the voluminous

gossip of that standard work, nor the same mass of detail as to individual trees, it is fully as practical, and, from its date of publication, naturally more comprehensive.

The first part is an Introduction in twenty-seven chapters, occupying about a hundred pages, and dealing with such general questions as propagation, hybridising, transplanting, pruning, selection for street-planting, wet or dry places or the seaside, with lists of varieties valuable for habit, foliage, or fruit. It begins with an historical sketch admirably adapted to the purpose of the work, tracing in eleven pages the introduction of woody plants into Britain from the time of the Romans and the works of Turner to Elwes and Henry's book and the collections of E. H. Wilson and George Forrest. In this we have only to object to the retention of the final "e" in Gerarde, the date 1596 instead of 1597 for his Herbal, and the statement that John Tradescant "appears to have been a Dutchman." Even in so brief a sketch it is, perhaps, hardly wise to write of the elder Aiton as "the author of the *Hortus Kewensis*" without qualification: Mr. Bean would have done well to consult the third Supplement to this Journal for 1912, where the history of the work is given at length. Many of Wilson's plants are as yet unidentified, but the author has included descriptions of nearly four hundred new Chinese trees and shrubs introduced within the last fifteen years, mainly by him.

The rest of the Introduction seems to us, so far as we are capable of forming an opinion, as practical and sensible as it is concise. We are glad to recognise here a portrait of the beautiful Jersey Elm (*Ulmus stricta* var. *Wheatleyi*) in the Terrace Gardens, Richmond, though the locality of the specimen is not stated. In the body of the work, too, it would have been as well to specify the locality of the fine old *Ginkgo* at Kew.

The descriptions are in plain English, technical terms being used as little as possible; but a brief glossary is given of those whose use is unavoidable. Part ii. is a descriptive list of genera, species, and varieties, arranged alphabetically. This arrangement has many inconveniences, to which are added those inseparable from a work of over 1400 pages having to be in two volumes. It is impossible always to bear in mind the author's conception of generic distinctness—which, by the bye, is by no means so lumping as those of Bentham and the Hookers. It is thus somewhat tiresome to find *Fagus* and *Nothofagus* in separate volumes, and, in some of the larger genera, to find allied species separated by the mere accident of an initial. At the same time, when the purpose of the book and the class of readers for whom it is intended are duly considered, we must admit that Mr. Bean is right in the course which he has adopted.

The authority, but not the reference, for the name is given, followed by any one familiar synonym—more would, in such a work, have been mere pedantry—and very often by a reference to a good figure. The excellent, concise, and original descriptions are succeeded by a paragraph giving the native country, date of

introduction, constitution, and garden requirements and merits of the species. It is noteworthy that both here and in the inclusion, or exclusion, of plants, "hardy" is taken to mean "hardy at Kew."

So concise is the whole treatment that within the compass of 1072 pages about 2800 species (exclusive of varieties) are described. We think that a continuous pagination might well have been adopted for the two volumes, but are thankful for the single full index under one alphabet. Full as it is, however, it should have been fuller. Mr. Bean has not been consistent in his exclusion of "names which appear in their proper order," and we think he would have been well advised—even at the cost of a few more pages—to have included all these.

No space is wasted in descanting on the uses of the timber or on the folklore of the trees, though neither topic is entirely neglected. Though the work is intended for the gardener or for the owner who grows for ornament, we confess to a little surprise at finding that it is the genus *Rhododendron* that occupies the greatest number of pages of any single genus; but here again, on consideration, we are not disposed to complain.

As to the illustrations in the text we are not convinced. In the absence of anything like dissections or analyses, they are mere suggestions of general habit, and have seldom much specific value. The whole-page plates are often admirable plant-portraits, but we are not sure whether there should have been many more of the smaller figures or none at all.

On the whole, however, as will be gathered from the smallness of the faults we have indicated, Mr. Bean is to be congratulated on a very excellent piece of work.

G. S. Boulger.

BOOK-NOTES, NEWS, &c.

The Rev. E. F. Linton issued in December the third fascicle of the Supplement to the Set of British Willows. It contains specimens of *Salix pentandra*, *S. alba*, *S. alba* × *pentandra* (two numbers), *S. fragilis*, *S. purpurea*, *S. aurita* × *cinerea*, *S. cinerea* × *phylicifolia* (three numbers), and *S. phylicifolia* (two numbers). The examples of *S. alba* × *pentandra* "will be especially welcome, since this has been an elusive hybrid and is wanting hitherto in the large majority of British herbaria; it is possible that they originated from the same stock." Of the thirty-five copies prepared, only two remain on hand. Material is accumulating for a fourth fascicle. Mr. Linton will welcome offers of cöoperation, which should be addressed to him at Edmondsham Vicarage, Cranbourne.

The Sixth Report of the Committee for investigating matters connected with the Botany of Devonshire is published in vol. xlvi of the Transactions of the Devonshire Association. Numerous records of phanerogams for each of the districts are given, and

there is a list of Fungi for the Honiton District. The Report is edited by Miss C. E. Larter.

THE second volume of *The Standard Cyclopedia of Horticulture* (Macmillan Co., New York), edited by Mr. L. H. Bailey (containing letters C—E), bears out the favourable opinion already expressed (Journ. Bot. 1914, 252) concerning the work. In the case of the larger genera, *e. g.* Chrysanthemum, the account given is a small treatise in itself, giving as it does most of the information we at present possess. The English reader will find much useful advice throughout such sections, and will be able to compare the American treatment with that of this country. These often differ—as an example may be quoted the treatment of the Dahlia: instead of, as in England, propagating from stem growths which are rooted and planted out in May or June, the growers throughout the U.S.A. use part of the root or tuber either planted whole or cut like a potato. The largest section in the volume is devoted to diseases and insects. These "so-called enemies of plants" are conveniently placed together; the section on plant diseases is by Professor H. H. Whetzel, who treats the subject in a general manner from a modern standpoint. Further subdivisions consider fungicides, with a "host index" containing suggestions as to the treatment of the diseased plant. A section headed "color in flowers" takes account of the chemistry and physics and the question of colour classification and colour harmonies. The illustrations add enormously to the usefulness and attractiveness of the volume. The half-tone photographs are excellent, and the coloured plates are good as far as colour reproduction goes, but the subjects in many cases might certainly be better chosen.—J. K. R.

A MEETING of the General Organizing Committee for the International Botanical Congress, which had been arranged to be held in London next May, was held at the Linnean Society's rooms on January 21st. A report was presented of the work of preparation which had already been carried out by the Executive Committee, and the members were asked to consider the present position. It was decided that the Congress should not be held in 1915, and that the present Executive Committee should continue to act as long as necessary. The Committee was strongly of opinion that the Congress in London should not be abandoned, and the suggestion was made that it might take place at the next quinquennium in 1920. But it was agreed that nothing definite could be settled at the present time, and the Executive Committee was authorized to convoke a meeting of the General Committee at some future period to consider the date at which the Congress should be held. It was also decided that in the meantime the General Committee be called together once a year.

THE Report for 1913 of the Botanical Exchange Club by the editor and distributor, Mr. A. B. Jackson, was issued in October last. A copy has recently reached us, from which we hope to give some extracts later.

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BRITISH AND FOREIGN

EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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ALGOLOGICAL NOTES.—XIV.–XVII.*

By G. S. West, M.A., D.Sc., F.L.S.

XIV.—Some Species of the Volvocineæ.

During the past few years a number of Volvocine Algæ have come under my notice which are of rather more than usual interest, some being apparently undescribed species, and others previously unrecorded for the British Islands.

1. Dunaliella salina (Dunal) Teodoresco, "Organisation et développement du *Dunaliella*, nouveau genre de Volvocacée-Polyblépharidée," Beihefte zum Botan. Centralbl. xviii. 1905; *Hæmatococcus salinus* Dunal in Ann. d. sci. nat. Botan. 2e série, ix. 1838; *Diselmis Dunalii* Dujardin, 1841; *Chlamydomonas Dunalii* Cohn, 1865.

Long. cell. 18–23 μ; lat. max. cell. 8·5–12 μ.

Hab. In some brackish pools on the south coast of Cornwall.

This interesting member of the Polyblepharidaceæ has not before been observed from the British Islands. It occurred in some little quantity in several small marshy pools which were subject to salt spray at high water, and were therefore brackish. Its distribution is largely Mediterranean, occurring in salt-marshes on both the European and African shores. It also occurs in the salt-marshes of Roumania and the south of Russia, and at Temacin in the Sahara. It is a very distinctive organism and is a biciliated type of the Polyblepharidaceæ—a family in which most of the genera possess more than two cilia. The detailed structure of this organism has been described both by Teodoresco and by Hamburger. The absence of a cell-wall and the presence of only a plasmatic membrane, which permits of considerable change of shape of the cell, at once excludes this organism from the Chlamydomonadeæ. Pascher's view † that *Dunaliella* is a reduced member of the Chlamydomonadeæ is not supported by the fact that the actual reduced saprophytic forms of the Chlamydomonadeæ all retain their cell-wall; moreover, *Dunaliella* seems to be on the direct line between the Polyblepharidaceæ and the Volvocaceæ.

2. **Carteria Oliveri**, sp. nov. Cellulæ vegetativæ (=zoogonidia) submagnæ, oblongo-cylindricæ, polis late rotundatis; membrana cellularum firma, ad polum anteriorem cum verruca rotundato-conica perforante et ciliis longis quattuor; chromatophora singula, permagna, valde granulata et cum pyrenoide magno singulo submediano vel extremo posteriori versus; stigma conspicua in parte anteriori cellulæ. Propagatio: cellula matricalis ad duas directiones oblique longitudinales in quattuor dividit.

Long. cell. 22–32 μ; lat. 13–18 μ; long. ciliorum 40–44 μ. (F. 1, A–C).

---

* Continued from Journ. Bot. 1912, p. 331.

† A. Pascher, "Zur Kenntnis zweier Volvokalen," *Hedwigia*, lii. 1912.

Hab. In the "*Glaux* Lagoon," Blakeney Point, Norfolk (coll. F. W. Oliver, 1913).

This species occurred in considerable quantity in a collection made by Professor F. W. Oliver at the above-named locality. It scarcely requires comparison with other species of the genus because its characters are quite distinctive. The cells are cylindrical with hemispherical ends, and at the anterior pole there is a perforated, bluntly conical wart through which the four cilia pass. The cell-wall is firm, and at the anterior end of the cell there is in active specimens a clearly evident mucous cap, which attains a thickness equal to the height of the perforated wart. The chloroplast is most massive, apparently leaving but little space for the lodgment of the nucleus. It contains a large globular pyrenoid, situated either in a median position or slightly towards the posterior end of the cell. The pigment-spot, or stigma, is very conspicuous, and it is located laterally about half-way between the pyrenoid and the anterior end of the cell.

Four daughter-cells arise in the mother-cell as a result of the formation of two obliquely longitudinal division-planes. The wall of the mother-cell becomes distended, and in some cases remains for a relatively long time around the daughter-cells.

C. Oliveri is nearest to *C. obtusa* Dill,* but differs in the cylindrical cells, with blunter extremities, in the position of the pyrenoid, the much more massive chloroplast, and in the situation of the stigma nearer the pyrenoid than the anterior end of the cell. The region of insertion of the cilia is also of a different character from that in *C. obtusa*.

3. Chlamydomonas reticulata Goroschankin in Bull. de la Soc. Impér. d. Naturalistes de Moscou, 1891, p. 30, t. 3, f. 1–9. *Chloromonas reticulata* (Gorosch.) Wille in Nyt Magazin for Naturvidenskab. xli. 1903, p. 150, t. 4, f. 27.

Long. cell. 34–38 μ; lat. cell. 30–33 μ.

Hab. In ponds, Berkswell, Warwickshire.

This species occurred sparingly in a number of small ponds in the neighbourhood of Berkswell in both 1913 and 1914. The cells are rather large as compared with most species of this genus, and are of a very broadly ellipsoidal form. At the anterior end is a large depressed wart through which the bases of the cilia pass. The chloroplast is parietal, much lobed and perforated. Under the place of insertion of the cilia it recedes from the cell-wall, and there is a small basin-shaped clear space in which two contractile vacuoles are situated. There are no pyrenoids, but a number of small grains of starch can be detected scattered through the chloroplast. The stigma is large and discoidal, being almost median in position. The species does not appear to have been previously recorded for the British Islands.

4. Chlamydomonas globulosa Perty, "Zur Kenntniss kleinster Lebensformen," 1852, pp. 86, 214, t. 12, fig. 1a. *Chloromonas*

* E. O. Dill, "Die Gattung *Chlamydomonas* und ihre nächsten Verwandten," Jahrb. f. wiss. Botanik, xxviii. 1895, p. 340, t. 5, f. 39–41.

globulosa (Perty) Gobi in Scripta botanica Horti Univ. Imper. Petropolitanæ, xv. 1899–1900, t. 6, f. 1, 2, 25–28.

Long. cell. sine integ. mucos. 21–28μ; lat. 19–26μ; long. ciliorum 34–38μ. (Fig. 1, D–F.)

Hab. In ponds, Earlswood, Warwickshire (October, 1914).

This species has up to the present been very imperfectly known. Perty's original account of it is meagre and his figure very poor. Wille, in his "Algologische Notizen. xi.; Über die Gattung Chlamydomonas," * does not figure it, and his description is most incomplete, since it is largely based upon Perty's original statement. Gobi,† although he described the attack of a parasitic fungus on this member of the Chlamydomonadeæ, did not add anything appreciable to our knowledge of its characters. Chodat's ‡ account of it appears to be a very erroneous one, possibly due to confusion with other species. He describes the large central hollow enclosed by the chloroplast as a "pyrenoid," whereas no pyrenoids occur in any of the cells.

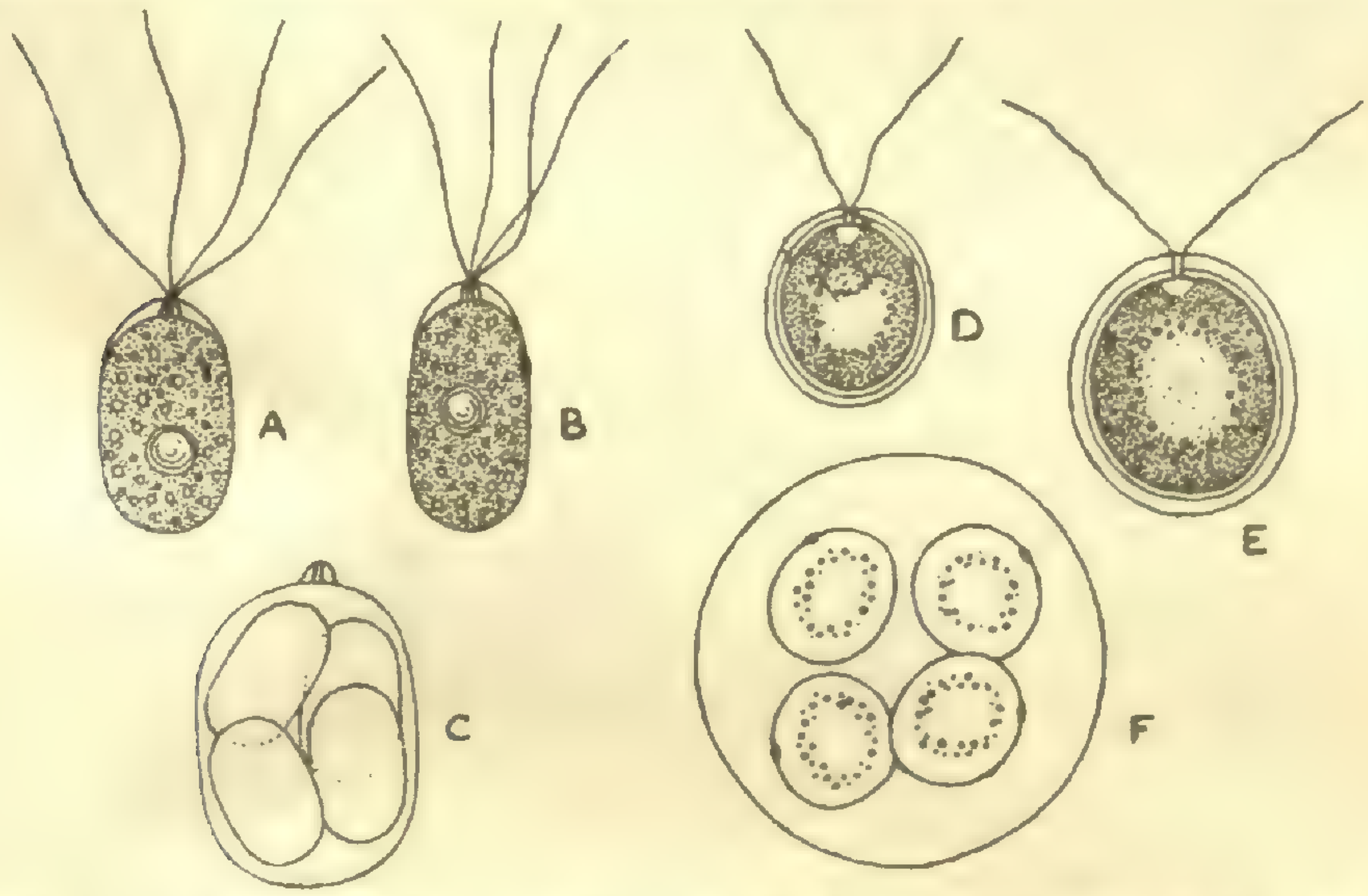

FIG. 1.—A–C, *Carteria Oliveri*. A and B, vegetative cells. C, four daughter-cells within mother-cell-wall. D–F, *Chlamydomonas globulosa*. D and E, vegetative cells. F, four daughter-cells surrounded by the gelatinized mother-cell-wall. All × 460.

The organism occurred in quantity in ponds greatly swollen by rain-water. The cell is not globose, but really very broadly ellipsoid, and external to the firm cell-wall is a mucous coat 2–3μ in thickness. This coat is of even thickness all round the cell, and consists of two very distinct layers. It is clearly visible in all living specimens. There is not the slightest trace of an anterior wart-like protuberance, the paired cilia passing through the firm cell-wall and remaining quite parallel until they emerge

* N. Wille in Nyt Magazin for Naturvidenskab. xli. 1903, p. 150.

† C. Gobi, "Ueber einen neuen parasitischen Pilz, *Rhizidiomyces ichneumon* nov. sp. und seinen Nährorganismus, *Chloromonas globulosa* (Perty)," Scripta botanica Horti Univ. Imper. Petropol. xv. 1899–1900.

‡ R. Chodat, *Algues Vertes de la Suisse*, 1902, p. 131.

from the mucous coat. The chloroplast is parietal and conforms to the shape of the cell; it is globular-ellipsoid and hollow, having at the anterior end a very small excavation immediately under the point of insertion of the cilia. The inner surface of the chloroplast adjacent to the central cavity—which in size is about one-third the diameter of the cell—is bordered by numerous small starch grains, but there are no pyrenoids present. The stigma is conspicuous and is discoidal with an elliptic outline. It is situated in the anterior half of the cell, about one-fourth to one-third the length of the cell from the anterior end. No contractile vacuoles were observed.

In cultures in rain-water, to which had been added a trace of a five per cent. nutritive solution, a *Glœocystis*-like state was quickly entered into. The cells divided rapidly, four daughter-cells arising within the mother-cell by two oblique longitudinal division-planes. In this state of the Alga the mucous coats increased very much in extent.

5. Chlamydomonas variabilis Dangeard in "Le Botaniste," 6e sér., 1899, p. 147, f. 17. *Chloromonas variabilis* (Dang.) Wille.

Forma anglica. Long. cell. 10–15·5 μ; lat. cell. 6·5–9 μ; long. ciliorum 13–17 μ. (Fig. 2, A–E.)

Hab. Near Studley, Warwickshire.

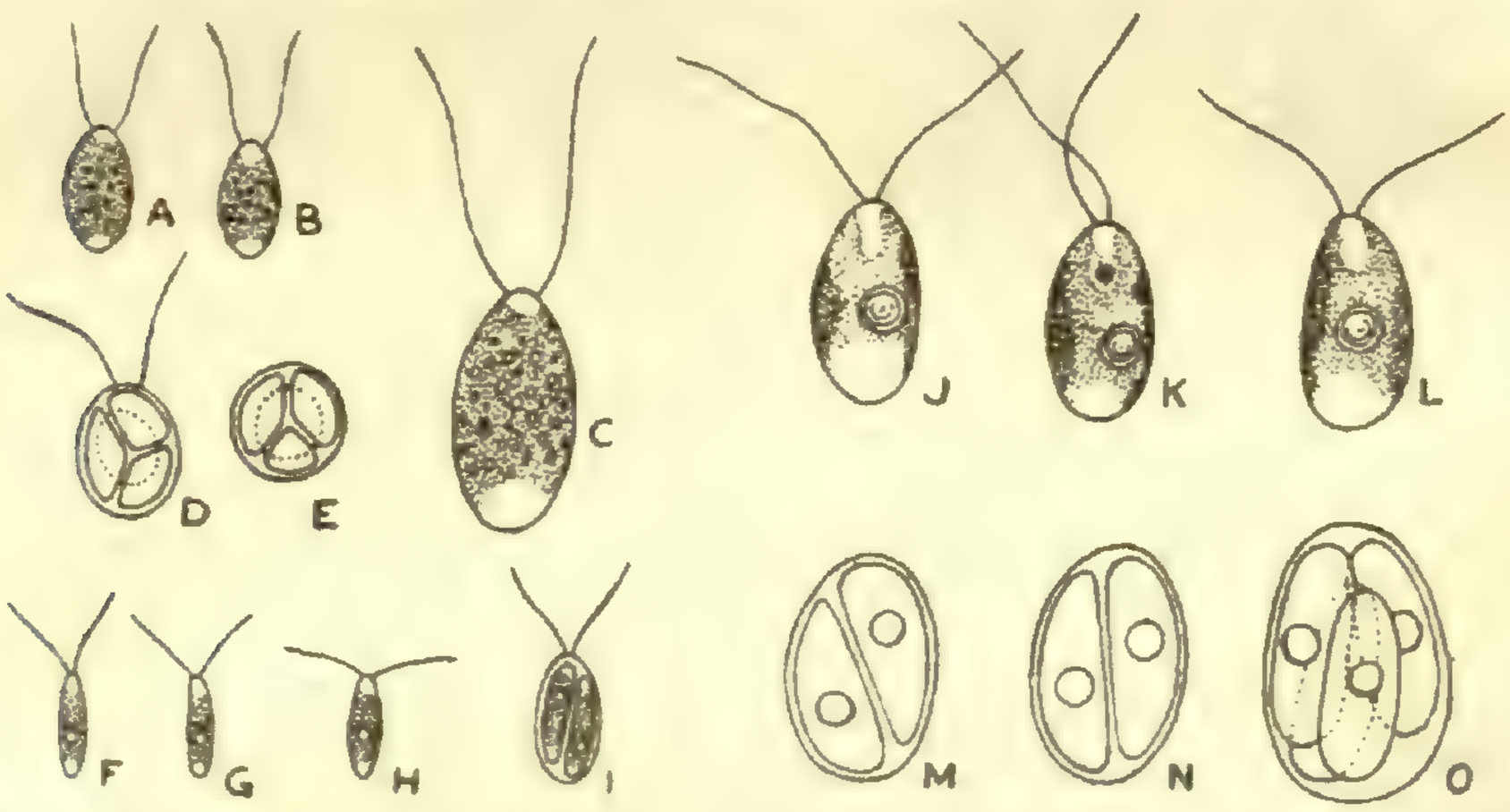

Fig. 2.—A–E, *Chlamydomonas variabilis* forma *anglica*. A–C, normal vegetative cells. D and E, tetrads of daughter-cells. F–I, *Chlamydomonas gracilis*. I shows the formation of two daughter cells. J–O, *Chlamydomonas elegans*. M–O show formation of daughter-cells. All × 460 except C, which is × 920.

This organism occurred in abundance in a small pond. It is smaller than that originally described by Dangeard, and it also differs in a few other particulars, such as the method of division of the mother-cell during the formation of a new generation of zoogonidia.

The cells were ellipsoid or obliquely ellipsoid, frequently with rather pointed poles, but never cylindrical. The anterior pole was invariably slightly protuberant, and in the vicinity of the insertion of the cilia quite colourless. There was also a colourless area at the posterior pole larger than that at the anterior pole. The

chloroplast did not extend, therefore, to either pole, but was very massive and occupied most of the rest of the cell. It was destitute of a pyrenoid, but contained numerous small starch-grains. The stigma was conspicuous, and either median in position or situated just behind the middle of the cell.

The origin of the zoogonidia (daughter-cells) did not entirely correspond with Dangeard's description. So far as could be judged in all the examples examined, four daughter-cells arose simultaneously by a tetrad division of the protoplast of the mother-cell (*vide* fig. 2, D and E). There was no preliminary transverse division.

6. **Chlamydomonas elegans,** sp. nov. Cellulæ vegetativæ (= zoogonidia) ellipsoideæ vel oblique ellipsoideæ, polo anteriori paullo angustiori quam polo posteriori; membrana sine verruca anteriori; chromatophora singula, parietali, partem medianam cellulæ limitata, cum pyrenoide singulo conspicuo; nucleo anteriori; stigma carente; partitione prima cellulæ matricalis suboblique longitudinali.

Long. cell. 23–27 μ; lat. 13–15 μ; long. ciliorum 28–33 μ. (Fig. 2, J–O.)

Hab. In rain-water pool, Sutton Park, Warwickshire.

This species occurred in great abundance in a small pool in May, 1913. The ovoid-ellipsoid cells were in most cases slightly oblique, one side showing a greater convexity than the other. The chloroplast was parietal, and occupied only the median part of the cell. It contained a rather large globular pyrenoid, and was peculiarly free from granules, reminding one of the chloroplasts in many species of *Ulothrix*. The clear colourless space behind the cilia was particularly deep, extending for fully one-third the length of the cell. There was also a very large clear space at the posterior end of the cell. No stigma (or pigment-spot) was present in any specimen observed; neither were any contractile vacuoles observed, although they may possibly have been present. The first division of the mother-cell is obliquely longitudinal (fig. 2, M and N), and sometimes a further longitudinal division occurs, so that four daughter-cells are formed (fig. 2, O).

Chl. elegans should be carefully compared with *Chl. Kuteinikowii* Gorosch., from which it differs in its larger size, its slightly oblique cells, the anterior position of the nucleus, the entire absence of a stigma, and in the longitudinal division of the mother-cells.

7. **Chlamydomonas gracilis,** sp. nov. Cellulæ vegetativæ (= zoogonidia) minutæ, elliptico-fusiformes, nonnunquam subcurvatæ, diametro circiter 4-plo longiores, polis rotundatis; membrana firma sine verruca anteriori; chromatophora singula cum pyrenoide singulo parvo submediano; stigma carente; partitione prima cellulæ matricalis longitudinali.

Long. cell. 11·5–12·5 μ; lat. cell. 2·6–3 μ; long. ciliorum 12–16 μ. (Fig. 2, F–I.)

Hab. In a boggy spring, Sutton Park, Warwickshire.

This species is readily distinguished by the small size and

narrowness of the cells. It occurred in large numbers in one of the half-stagnant pools at the margin of a boggy spring. It was first noticed in April, 1912, and at this time I thought it must be a great swarming of zoogonidia of some higher type of Green Alga. The spring in which it occurred had been kept under continuous monthly observation for five years, and reference to the records showed that the only Green Algæ which had been observed during this period were one species of each of the following genera :—*Spirogyra*, *Mougeotia*, and *Vaucheria*. Obviously these motile cells could in no way be connected with those Algæ. In the spring months of 1913 the *Chlamydomonas* again occurred in great quantity in exactly the same place, and on this occasion the formation of daughter-cells was observed, the protoplast of the mother-cell dividing along a slightly oblique longitudinal plane. The chloroplast occupies all the median part of the cell, and contains a small but conspicuous pyrenoid. There is a relatively large clear space at the anterior end of the cell and a smaller one at the posterior end.

XV.—Observations on the Structure and Life-History of Mesotænium caldariorum (Lagerh.) Hansg.

This Desmid was first described by Lagerheim * under the name of *Mesotænium Endlicherianum* Näg. var. *caldariorum*, but two years afterwards Hansgirg † raised it to specific rank as *M. caldariorum*. The change made by Hansgirg was probably a correct one, since *M. caldariorum* appears to be a most characteristic species, the rather sudden attenuation of the extremities of the cells being a unique feature within the genus. There is also a faint and almost imperceptible narrowing of the median part of the cell. *M. caldariorum* is apparently a very rare Desmid. It is known from Sweden, Bohemia, and Ecuador, and there is up to now one British record.‡ It is a subaërial species of the genus, and, so far, has been mostly found on the damp walls of green-houses.

In traversing the Worcestershire area of the Wyre Forest in September, 1911, an extensive green stratum was observed under certain oaks and birches. This proved to be a pure stratum of *Mesotænium caldariorum*. Cultures of this Desmid were started on sterilized porous sandstone, the lower part of which was immersed in sterilized rain-water. Some of the stratum, with a small quantity of the underlying soil, was spread on the surface of the sandstone, and it was soon observed that the *Mesotænium* multiplied enormously. It not only formed a stratum on the sandstone, but an immense number of individuals were found on the surface of the surrounding water, having all the appearance of a quantity of fine dust on its surface. These individuals were in no way immersed in the water, but were living in a damp (probably saturated) atmosphere.

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* G. Lagerheim, Algologiska Bidrag. I., *Botaniska Notiser*, 1886, p. 48, f. 4 xylogr.

† A. Hansgirg, *Prodromus der Algenflora von Böhmen*, Prag, 1888, p. 174.

‡ W. & G. S. West in Bot. Trans. Yorks. Nat. Union, v., 1900, p. 42.

The cells were often asymmetrical, and the longer ones not infrequently bent (fig. 3, C). The chloroplast is plate-like, extending from end to end of the cell, and also from side to side. In the shorter cells it contains one pyrenoid, and in the longer ones two pyrenoids. As in other species of this genus, a fatty oil is often stored as a reserve, in which case the pyrenoids usually quite disappear. The oil globules are scattered irregularly about the cell outside the chloroplast (consult fig. 3, C, D and I). The nucleus is exceedingly small, median in position, and closely pressed against the chloroplast, as in species of *Mougeotia*.

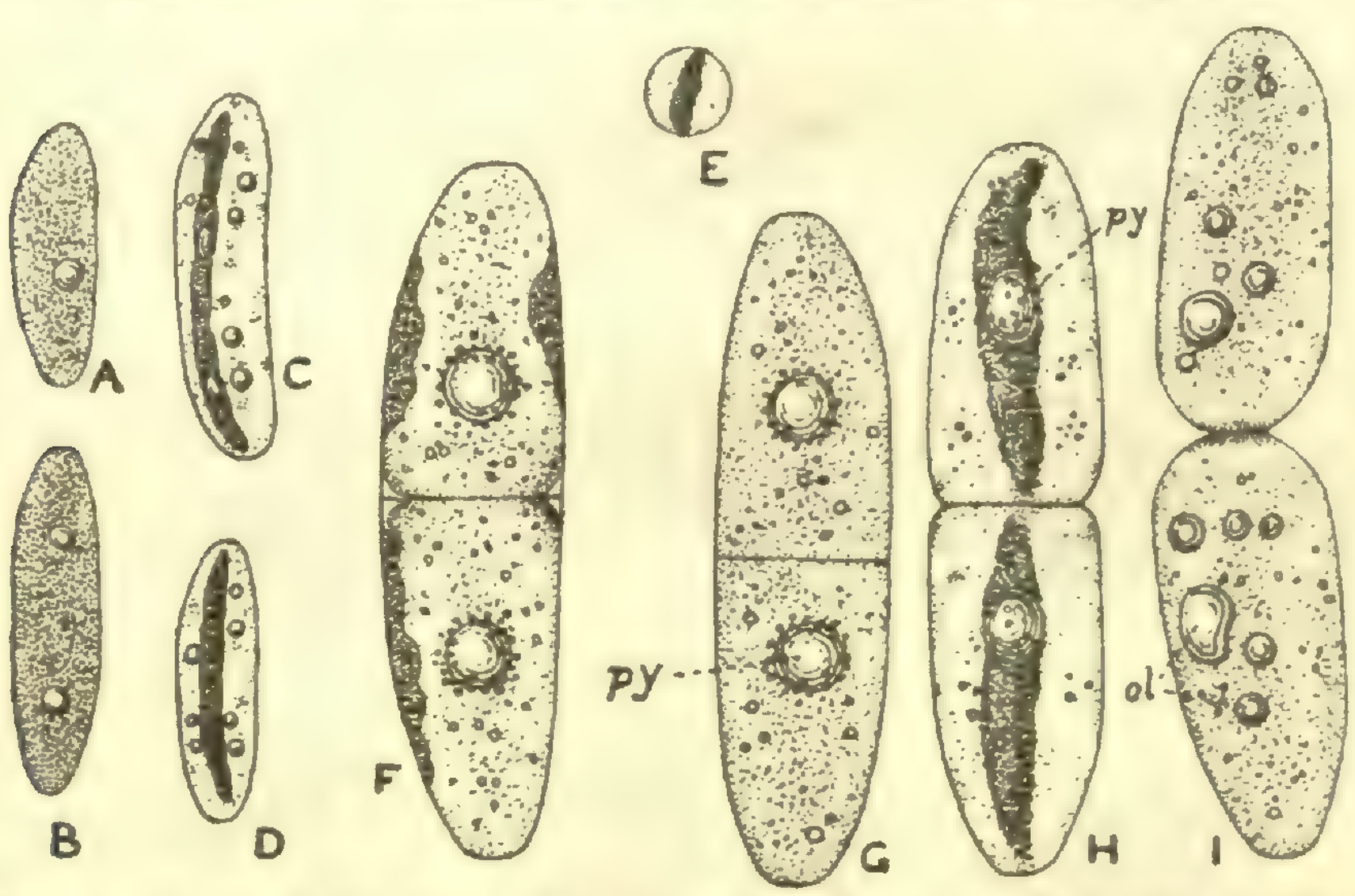

FIG. 3.—Vegetative cells and cell-division of *Mesotænium caldariorum*. A–E, typical vegetative cells. C and D show the single chloroplast from the edge. E is the end view. F–I, stages in cell-division. *py*, pyrenoid. *ol*, oil globule. A–E, × 460. F–I, × 920.

The cell-division of *Mesotænium caldariorum* is precisely as in the Placoderm Desmids. After the division of the nucleus a new cell-wall is laid down in an exactly transverse plane (fig. 3, F) in a manner very similar to that which occurs in the Zygnemaceæ. On the completion of this wall there is no trace of a constriction of the cell (fig. 3, G). The new semicells are now developed as in other Desmids. The middle lamella of the new transverse wall gradually disappears from the periphery inwards, and during its disappearance (which probably results from its conversion into mucilage), the part of the new wall belonging to each semicell begins to bulge outwards, assuming a greater and greater convexity (*vide* fig. 3, H and I). This finally results in a separation of the two daughter-cells.

In May, 1913, large numbers of zygospores were formed in the cultures, more especially on the drier parts of the sandstone. Conjugation was quite normal as it occurs in the genus, and the zygospores were rounded-angular, with thick walls and several lamellose outer coats (fig. 4, C). The zygospores, after being in a state of partial desiccation for several months, germinated in September. Hundreds of germinating zygospores were examined, and the outer lamellose coats gradually disappeared and the oily

protoplast divided. With very few exceptions the protoplast divided only once, so that only two young individuals (embryos) arose from each zygospore (fig. 4, D–G). In a few cases, but certainly not in 2 per cent. of the whole, there was a second division resulting in four embryos, but so far as *Mesotænium caldariorum* is concerned the production of four embryos (fig. 4, H and I) must be regarded as exceptional. The young cells were in all instances loaded with oil globules, and it was not until several divisions had taken place that the characteristic form of the species was regained.

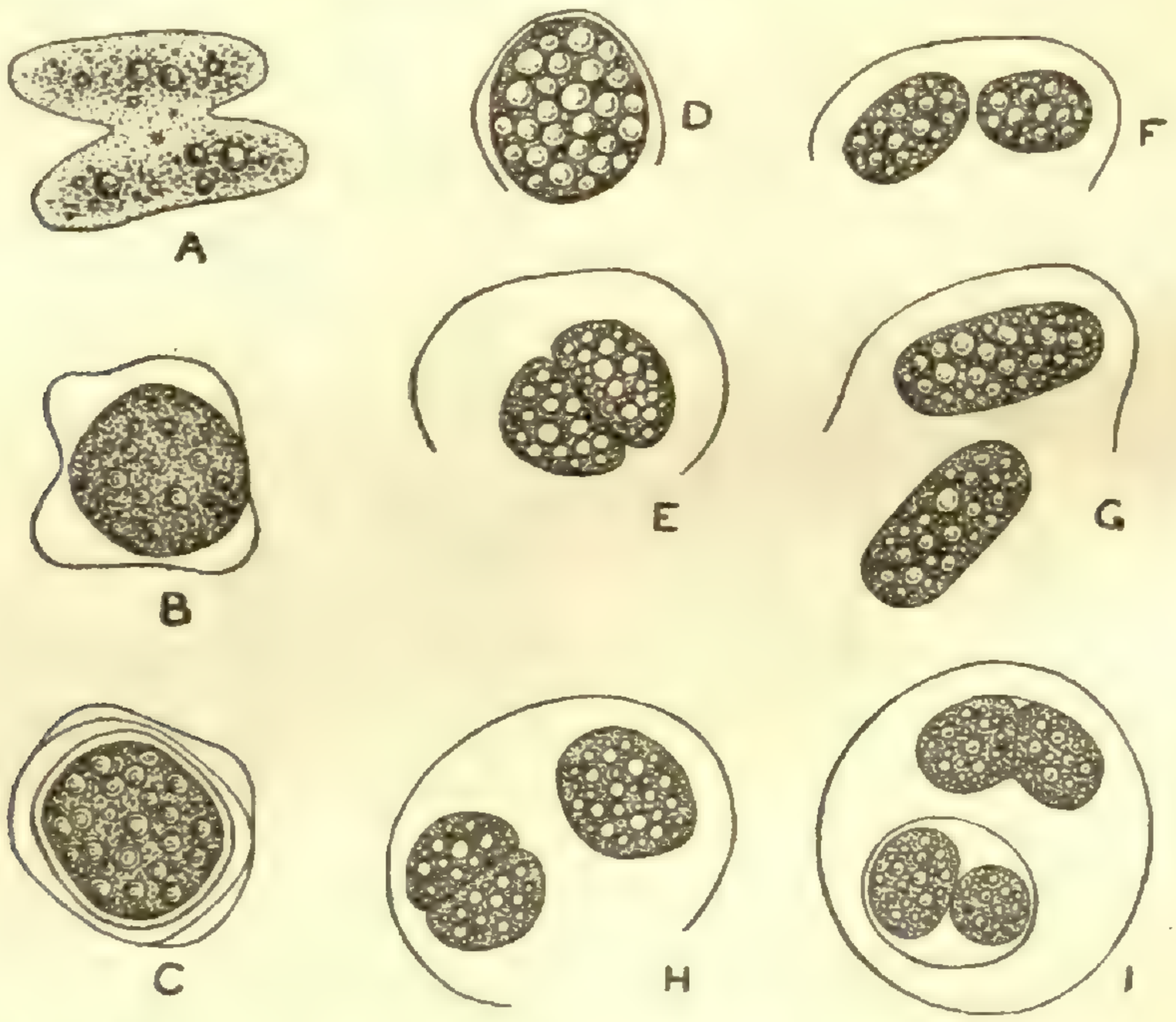

FIG. 4.—A–C, conjugation of *Mesotænium caldariorum*, C being the completed zygospore. D–I, germination of zygospore. D–G, the usual germination with the formation of two embryos. H and I, the exceptional germination with formation of four embryos. All × 460.

The foregoing observations on the cell-division and germination of the zygospore of *Mesotænium caldariorum* are of particular interest in view of the attempt by Oltmanns* to establish within the Conjugatæ a third family, *viz.* the Mesotæniaceæ. He subdivided the Conjugatæ into the three families of the Mesotæniaceæ, Zygnemaceæ and Desmidiaceæ. After acquiring a singularly extensive knowledge of the Desmidiaceæ, this is a view to which I cannot subscribe, and the late Dr. Lütkemüller, of Vienna, who had studied the morphological details of European Desmids very thoroughly, informed me in various letters that he could not support Oltmanns' views. The family Mesotæniaceæ of Oltmanns is precisely equivalent to the sub-family Spirotæniæ of Lütkemüller,† and the removal of these undoubted Desmids from the family Desmidiaceæ seems to me to be contrary to their affinities.

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* F. Oltmanns, *Morphologie und Biologie der Algen*, Jena, 1904.

† J. Lütkemüller, "Die Zellmembran der Desmidiaceen," Cohn's *Beiträge zur Biologie der Pflanzen*, viii. 1902.

There is no essential *family* difference between a *Mesotænium* and a *Closterium*. The fact that there is no actual line of junction between the new and the old half-cells in the Spirotæniæ is of little importance, since the development of the new half-cells is the same as in *Closterium** and other Desmids. Oltmanns' further contention that in those Desmids which he would place in the "Mesotæniaceæ" the germination of the zygospore results in the production of four embryos is not altogether supported by facts. In *Mesotænium caldariorum* the usual number of embryos is *two*, four being quite exceptional. Moreover, on the germination of the zygospores of other species of *Mesotænium* and of *Cylindrocystis Brébissonii* the number of embryos may only be two. Considering the above-mentioned facts and the probable phylogeny of Desmids as a whole, I am quite unable to support the establishment of the family Mesotæniaceæ proposed by Oltmanns.

XVI.—Two New Species of Ulothrix.

1. **Ulothrix spiroides**, sp. nov. U. sublimnetica, inter alias Algas libere natans; filis angustissimis et brevibus, in spiram laxam vel laxiusculam plus minusve regulariter contortis, cellulis diametro $4\frac{1}{2}$–$8\frac{1}{2}$-plo longioribus; cellulis apicalibus obtusis; chromatophora parietali plerumque unilaterali, sine pyrenoide. Crass. fil. 1 μ; diam. spir. 17–23 μ, anfractibus 23–35 μ inter se distantibus. (Fig. 5.)

Hab. Abundant in the lakes at Great Barr Park, Staffordshire. (Oct. 1911.)

This minute *Ulothrix* occurred in great abundance in the above-mentioned locality. I had thought at first that it might be a form of *Ulothrix limnetica*, Lemmermann, but it is entirely different from that species. The nearest described Alga is undoubtedly *Glœotila contorta* Chodat,† but the published account of this species is most meagre. The Staffordshire plants differ in so many important respects from Chodat's species that it is impossible to regard them as other than distinct. In the first place, there is a complete absence of the wide mucous sheath which appears to be a characteristic feature of *Glœotila contorta*. The cells are also of less diameter, and

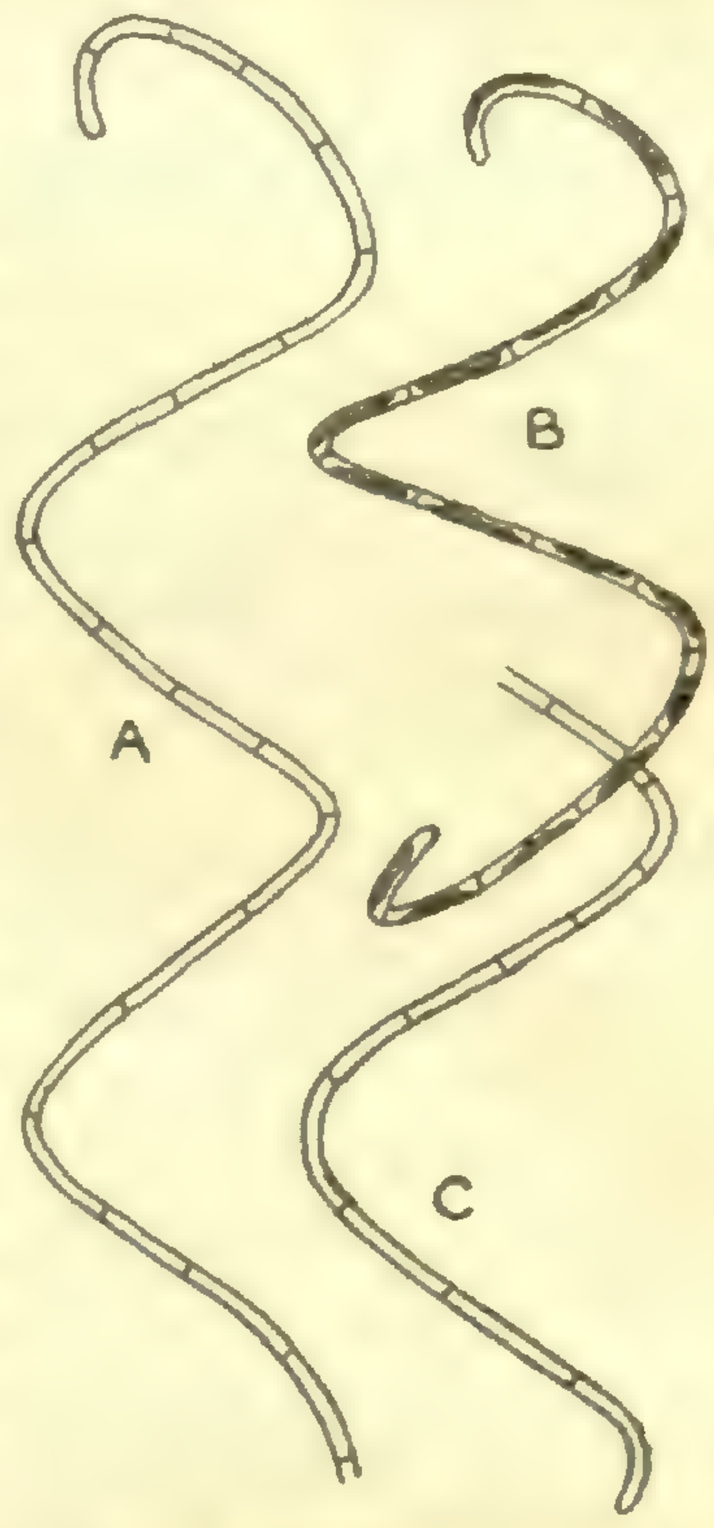

Fig. 5.—*Ulothrix spiroides*. A–C, three filaments, × 920. The chloroplasts are only shown in B.

* Consult B. F. Lutman, "Cell and Nuclear Division in Closterium," Botan. Gazette, li. 1911. Cell-division in *Mesotænium caldariorum* is exactly similar to that described and figured by Lutman as occurring in *Closterium Ehrenbergii*. Compare fig. 3, F–I, with Lutman's figures 3–8 on plate xxii. of his paper. † R. Chodat in Bull. de l'Herb. Boiss. 1900, p. 10, fig. 20.

they form truly cylindrical filaments, never being more or less disconnected, with rounded ends, as in *Glœotila contorta*.

2. **Ulothrix subconstricta,** sp. nov. U. filis angustis, elongatis et subrigidis, inter cellulas leviter constrictis, membrana cellularum delicatissima; cellulis diametro 2–4-plo longioribus, ad polos levissime dilatatis; chromatophora singula parietali lobata, partem medianam cellulæ limitata, sine pyrenoide. Crass. fil. 6·8–7·9 μ. (Fig. 6.)

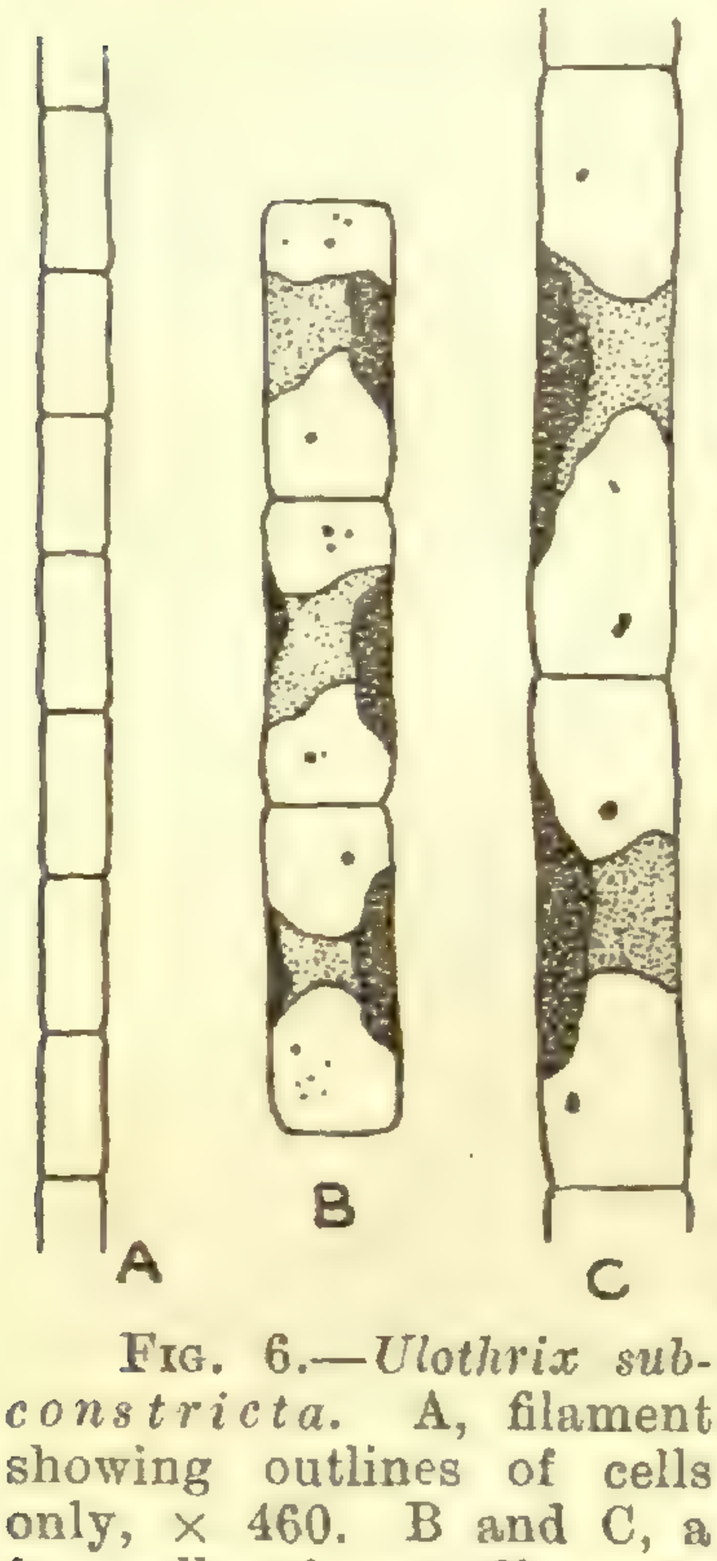

Fig. 6.—*Ulothrix subconstricta.* A, filament showing outlines of cells only, × 460. B and C, a few cells of two filaments showing cytological characters, × 920.

Hab. In a pond at King's Norton, Worcestershire.

This species has been under observation for three years, during which time it has retained very distinctive characters. It does not agree with any known species, and it has therefore been necessary to describe it as new. The cells vary considerably in length, but all show the same distinctive features. Each cell is a little narrower in the middle than at the two poles, which are very slightly inflated. There is also a very slight constriction between adjacent cells. These are characters not possessed by any other species of the genus. The chloroplast is equally characteristic, being a parietal plate of somewhat irregular outline, confined to the median part of the cell, and only occupying about two-thirds the circumference of the cell-wall. One or more conspicuous granules are present in the sap-vacuole, and are generally situated in the clear polar portions of the cell. The cell-wall is very thin, and there is no trace of a mucous sheath around it. The zoogonidia were not observed, and attempted cultures of the Alga were entirely unsuccessful.

XVII.—The Genus Tetradesmus.

The genus *Tetradesmus* was described by Smith* in 1913 for a small Alga differing from *Scenedesmus* in the grouping of its cells. Smith made very careful cultures of this Alga, which he named *Tetradesmus wisconsinensis*, and showed clearly that it was not a cultural form of *Scenedesmus*, but that reproduction took place by autocolonies, in which the cells assume the normal arrangement of the adult before being set free from the mother-cell-wall. Chodat† has recently placed this Alga in the genus

* G. M. Smith, "Tetradesmus, a new four-celled cœnobic Alga," Bull. Torr. Bot. Club, xxxix. March, 1913.

† R. Chodat, "Monographies d'Algues en Culture pure," Matér. pour la Flore cryptogam. Suisse, iv. Berne, 1913.

Scenedesmus, but his reasons for this are not at all clear, and I have recently contested this view* and stated "that Smith's careful cultural work indicates that *Tetradesmus* possesses a morphological character of such importance as to warrant its generic rank." That others have arrived at a similar conclusion is evidenced by the fact that Woloszynska † has just described a genus from the Victoria Nyanza under the name of "*Victoriella* n. gen." which is identical with Smith's genus *Tetradesmus*.

I have also another species of the genus from the English Lake District, which I propose to describe as a new one, *viz.* :—

Tetradesmus cumbricus, sp. nov. Cœnobia e cellulis quaternis ut in *T. wisconsinensi* dispositis; cellulis late ellipticis diametro circiter duplo longioribus, cum polis acutis et leviter incrassatis; membrana cellularum firma, chromatophora cum pyrenoide singulo. Long. cell. 25–30 μ; lat. cell. 11–13·5 μ; diam. cœnob. 22–32 μ. (Fig. 7.)

Hab. In the plankton of Ennerdale Water, Cumberland. (Aug. 1908.)

Not more than half-a-dozen specimens of this Alga were observed. When found in 1908 I made careful drawings, which are here reproduced. These were put aside at the time with a provisional note "New genus; material insufficient." Since Smith has been able to establish the genus on ample material, I have not the slightest hesitation in describing the English Alga as a new species. It is distinguished from *T. wisconsinensis* by its larger size, the different shape of its cells, which are stouter and without the attenuated extremities, and also by its much stronger cell-wall. The wall of *T. cumbricus* is quite unlike that of a *Scenedesmus*, and is as thick as that of *Oocystis solitaria*.

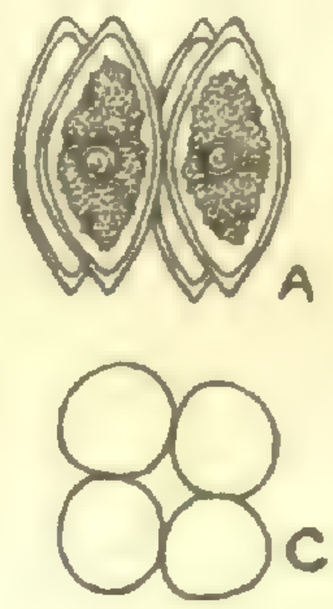

Fig. 7.—*Tetradesmus cumbricus*. A and B, cœnobia from the side; C, cœnobium from the end. × 460.

The genus Tetradesmus G. M. Smith, 1913 (= *Victoriella* Woloszynska, 1914) belongs to the sub-family Selenastreæ of the Autosporaceæ, and is not very far removed from *Ankistrodesmus*, especially such a species as *A. quaternatus* W. & G. S. West.‡ It contains three species which may be summarised as follows:—

1. T. wisconsinensis G. M. Smith. Cells elliptic-fusiform, with attenuated and rather blunt extremities which are outwardly divergent; pyrenoid excentric. Length of cells 12–14·5 μ, breadth 4–5·8 μ.

Hab. Floating in sluggish streams and lakes at Madison, Wisconsin, U.S.A. Also in Norway (1914).

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* G. S. West in Journ. Bot. Oct. 1914, p. 278.

† J. Woloszynska, "Studien über das Phytoplankton des Viktoriasees," *Hedwigia*, lv. 1914.

‡ W. & G. S. West, "Freshwater Algæ from Burma, &c.," Ann. Roy. Botan. Gard. Calcutta, vi. part ii. 1907.

2. T. Ostenfeldi (Woloszynska), nov. comb. (= *Victoriella Ostenfeldi* Woloszynska). Cells obliquely ellipsoid, with the extremities outwardly divergent and drawn out into sharp slender spines; pyrenoid central. Length of cells 8 μ; breadth 4 μ.

Hab. In the plankton of Victoria Nyanza, Africa.

3. T. cumbricus G. S. West. Cells broadly elliptic, straight, with acute poles; cell-wall strong and firm, thickened at each pole; pyrenoid central. Length of cell 25–30 μ; breadth 11–13·5 μ.

Hab. In the plankton of Ennerdale Water, England.

The three species just enumerated are discriminated by the shape of their cells. *T. cumbricus* is much larger than the other two, and differs from both in the straight cells, the extremities of which are not attenuated. It is also the only species with a thick cell-wall.

SUSSEX RUBI.

By the Rev. W. Moyle Rogers, F.L.S.

(Concluded from p. 56.)

Sub-Koehleriani.

Rubus Babingtonii Bell Salt. Fairly common, but variable. **W.** Abundant between the Depôt Road, Horsham, and St. Leonards, *W.*! Holmbush; near Terrible Down, *H.*! "Hesworth Common" (also called "Fittleworth Common," as in the preceding pages of this article); Shottermill; Linchmere; near Burton; Midhurst Common; Stopham; Bognor Common. **E.** Stanmer Park, &c.; Streat to Plumpton; The Alders, Cooksbridge, *H.*! Uckfield, *F.*! Hendall Wood, *Roffey*! Near Tunbridge Wells. Battle. St. Leonards-on-Sea.

R. ericetorum Lefv. **W.** About as frequent as the last, and locally abundant. Lavington, Duncton and Ambersham Commons. Chalk-pit, Graffham. Storrington to Thakeham and Washington, *H.*! Fittleworth to Pulborough and Stopham. Bognor Common. Redhill Hollow, Coates. Midhurst. Near Petworth Station. **E.** Polgate to Priests' Haws; Markly; Hellington, *R.*! Usually quite characteristic.

R. mutabilis Genev. **W.** Midhurst Common (very scarce), *M.* Rudgwick, *W.*! Near Lynch, *F. A. R.*! Near Midhurst, on Petersfield Road, in fair quantity, 1914.

Var. Naldretti J. W. White, Watson Bot. Exch. Club, 1906–7 (as quoted in this Journal for 1908, p. 24). **W.** Roadside waste in Thakeham parish, at the back of the South Downs, "in great abundance for several miles," *W.*! Henfield to Sharmanbury, *H.*! In a wood by Eridge Rocks, near Tunbridge Wells, Dr. Gilbert has found a bramble which seems to be a weak form of *R. cavatifolius* P. J. Muell., otherwise unknown in Sussex.

R. Bloxamii Lees. **E.** High Steep, Jarvis Brook, *J. Comber*! Ashdown Forest, near Wych Cross, *H.*; apparently a variety of this!

Sub-Bellardiani.

R. FUSCUS Wh. & N. Apparently uncommon. **W.** Downs above Bignor, *M.* Bognor Common, *L. C.*! and *M. A. R.*! Midhurst Common, 1901. Fittleworth to Pulborough. **E.** Blackdown, Uckfield, *F.*! Waterdown Lane, near Tunbridge Wells.

Var. NUTANS Rogers. **W.** Lavington; Graffham; Midhurst Common, *M.*! **E.** Crowborough Warren, 1908, *H.*!

Var. OBSCURUS (Kalt.). **W.** Wooded downs north of Madehurst and Slindon, and near Upwaltham, abundant, *M. & Linton.*

R. PALLIDUS Wh. & N. Uncommon. **W.** Old Bury, Lavington, 1901, *M.* Copyhold, *Druce*! **E.** Hurstmonceaux, *Druce*!

Var. LEPTOPETALUS Rogers. **W.** Shottermill. Linchmere. Near Madehurst and Upwaltham. **E.** Lane End Common, 1909, *H.*!

R. GLAREOSUS Rogers & Marshall, Journ. Bot. 1912, pp. 309–11, 374. **W.** Common. Linchmere, 1900. Sandy woods between Graffham and Heyshott, 1901, *M.*! Billingshurst, 1912, *A. Webster*! Near Petworth Station; Midhurst Common, by Fittleworth, to Pulborough, &c.; Bognor Common; Henley. Mostly a luxuriant state, with panicle strongly developed and having rather more mixed armature than the *average* Surrey plant. I have not yet seen East Sussex examples, but they probably occur in plenty near the western boundary of that vice-county, if not further east.

R. SCABER Wh. & N. ***W.** Midhurst neighbourhood; fairly frequent, but variable. **E.** Ashdown Forest, 1904, *Waddell*!, a very prickly form. Wood, Berwick, 1909, *H.*! Staple Cross, sandstone cutting, *C. E. Brown*, 1913!

R. THYRSIGER Bab. **E.** Starvecrow Wood, near Carter's Corner, *R.*! Near Tunbridge Cemetery, *G.*!

R. FOLIOSUS Wh. & N. Frequent in woods and thickets. **W.** St. Leonards Forest, *W.*! and *Groves*! Henfield, *Borrer.* Shottermill. Blackdown, near Haslemere. Burton Park. Midhurst Common. Selham to Midhurst. Bedham to Fittleworth. **E.** Little Markly; near Heathfield, &c., frequent, *R.*! Near Uckfield, *F.*! Cooksbridge, *H.*! Waterdown Lane, near Tunbridge Wells.

Koehleriani.

[R. ROSACEUS Wh. & N. **W.** Near Horsham; coppice hedge at Lower Broadbridge, Slinford Parish, *W.*—Var. HYSTRIX (Wh. & N.). **W.** Near Rudgwick, *W.* **E.** Hellingley to Horsbridge, *R.* Bracketed as desiderating recent confirmation. I have no Sussex specimens of either *rosaceus* or *hystrix*; and most, if not all, of the Sussex plants to which formerly one or other of these names was given certainly belong to the new species *R. glareosus*.]

Var. INFECUNDUS Rogers. **W.** Near Burton Mill, *S.*! Petworth, 1901. Near Arundel, on chalk, *F. A. R.*!.

Var. ADORNATUS (P. J. Muell.). **W.** Horsham and Holmbush;

Fay Gate, St. Leonards Forest, *W.*! Near Burton Rough, 1901. Bognor Common. **E.** Wood near Chailey, *H.*! Waterdown Lane, near Tunbridge Wells (apparently this).

R. HORRIDICAULIS P. J. Muell. **W.** St. Leonards Forest, *W.*! Henfield to Barrow Hill, Small Dole, 1907; lane west of Henfield, 1909, *H.*! **E.** Near Streat, *Roffey*, 1909!

R. HOSTILIS Muell. & Wirtg. **E.** Battle, woods, variable but mostly luxuriant.

[R. FUSCO-ATER Weihe. **E.** Waterdown Lane, near Tunbridge Wells, 1902; apparently this species, as also at the following locality: woods near Hurstpierpoint, *Roffey*, 1910!]

R. KOEHLERI Wh. & N. **W.** St. Leonards Forest, *Borrer* (*teste C. C. B.*). By Hammer Ponds, *W.*! Wiston, *H.*, a form! **E.** Washington Common, *H.*, a form!

Var. COGNATUS (N. E. Brown). **W.** Henfield Common, *H.*! St. Leonards Forest; Holmbush, *W.*!

R. DASYPHYLLUS Rogers. Rare or uncommon. **W.** Near Fittleworth. Stopham. Bognor Common. Henfield, *Borrer* (*teste C. C. B.*) (as "*R. pallidus* Weihe"). **E.** Near Priest Haws, Westham; Hellington, *R.*! Balcombe, *Mitten* (*teste C. C. B.*) (as "*R. pallidus* Weihe"), *British Rubi*.

R. MARSHALLI Focke & Rogers. Locally abundant. **W.** Midhurst to Fittleworth and Bedham. Henley. Selham. Shottermill. Blackdown (near Haslemere). Graffham Common. Lavington. Colegate, *W.*! St. Leonards Forest, *Roffey*! **E.** Near Tunbridge Wells, 1899, *G.*! Waterdown Lane, 1902.

Var. SEMIGLABER Rogers. *W. Heyshott.

BELLARDIANI.

This difficult group is fairly well represented in Sussex; but many of the species are so imperfectly understood by us that in most cases further records are desirable for confirmation.

R. DUROTRIGUM R. P. Murray. *W. Fittleworth to Benham and to Petworth; locally abundant, 1914. Clearly identical with Mr. Murray's Dorset plant, though in some of the bushes the leaflets (otherwise most characteristic) are rather more irregularly serrate, and occasionally not at all deeply incised. A very interesting extension of distribution for this species, as hitherto Dorset has been the only county known for it with certainty, though Dr. Gilbert has found what seems to be a small state in two localities near Tunbridge Wells (West Kent), just beyond the Sussex border.

[R. VIRIDIS Kalt. and R. DIVEXIRAMUS P. J. Muell. are not certainly known for Sussex; but the late Mr. Hilton found (in 1909) a plant which may belong to *R. viridis* near Uckfield (**E.**), and (in 1907) another, which at least strongly resembles *R. divexiramus*, at Ambersham Common (**W.**).]

R. BELLARDII Wh. & N. **W.** Coppice on Sansom's Farm, Rudgwick, *W.* Old Bury, Lavington; thicket, north of Made-

hurst, *S.* Popple Hill, Graffham, 1901. Dense copse on Pulborough Road, near Fittleworth. **E.** Mitchelham Priory; Heathfield Park; Kemp's Wood, Markley; Abbots' Wood, *R.*!

R. SERPENS Weihe. **W.** Near St. Leonards House, Horsham, 1903, *S.*! Benham to Bognor Common. **E.** Wood near Uckfield, towards Blackdown; Downland Wood, *F.*!

R. HIRTUS Waldst. & Kit. **W.** Wakehurst, *Mitten* (*teste C. C. B.*). Albourne, *Borrer.*

Var. ROTUNDIFOLIUS Bab. ***W.** Near Midhurst, on the Selham Road, 1914; in good quantity, in partial shade, but very characteristic.

Var. KALTENBACHII (Metsch.). ***W.** Bognor Common, 1914, *M. A. R.*! A very luxuriant and handsome plant. **E.** Downhead Wood and neighbourhood, *F.*! Apparently this.

Var. FLACCIDIFOLIUS (P. J. Muell.). ***W.** Near Midhurst, 1914.

Var. RUBIGINOSUS (P. J. Muell.). ***W.** Benham, 1914, *F. A. R.*! Indistinguishable from plants thus named confidently by Dr. Focke from several British and Irish counties.

Var. MINUTIFLORUS (P. J. Muell.). ***W.** Wood near Cocking; Cowdray Park, 1907, *H.*! All the plants referred to here as varieties of *R. hirtus* must, I believe, be referred to the "*hirtus* group," which, though apparently uncommon everywhere, seems to be unusually well represented in Sussex, especially in the Fittleworth and Midhurst districts. Our acquaintance with these plants, which Dr. Focke has taught us to associate with *R. hirtus*, is necessarily incomplete for lack of good representative Continental specimens; but I have a fair series of British examples so named by him, and have spared no pains in my study of these from Sussex.

[R. TERETICAULIS P. J. Muell. **E.** Wood south of Chailey Station, 1906 and 1907, *H.*!—R. VELATUS Lefv. **E.** Eridge to Frant Road, 1904, *G.*! Both rather uncertain.]

CÆSII.

Except in the chalk districts of the county, members of this group are, as a rule, quite uncommon.

R. DUMETORUM Wh. & N., sp. coll. **W.** Graffham. Rogate. Hedge near Cuckfield, 1901, *H.*! Midhurst Common, 1902, *S.*! **E.** Nightingale Hollow. Kenwards, near Lindfield, 1902, *Standen*!

a. FEROX Weihe. Dyke's Downs; lane out of Montpelier Road, Hove, 1901, *H.*! **E.** Waterdown Lane, Tunbridge, 1902. Bexhill. St. Leonards-on-Sea. Racecourse to lighthouse (? Eastbourne), *R.*!

b. BRITANNICUS (Rogers). **E.** Hemstead Lane, Uckfield, *F.*!

c. DIVERSIFOLIUS (Lindl.). **W.** Henfield, *C. C. B.* "Frequent," *W.* **E.** Abbotswood; Hailsham to Folkington; Polegate neighbourhood, *R.*!

f. TUBERCULATUS Bab. **W.** Henfield, *C. C. B.* Near Petworth Station.

h. RADULIFORMIS Ley. **E.** Seaford, *Standen*, 1912! Apparently this, but very weak.

j. FASCICULATUS P. J. Muell. **W.** Henfield and Albourne, *C. C. B.* as "*R. corylifolius* var. *purpureus*."

R. CORYLIFOLIUS Sm., sp. coll. Fairly common. **W.** "Frequent," *W.*! Fittleworth to Pulborough, 1914.

a. SUBLUSTRIS Lees. **W.** Albourne and Newtimber, *Borrer* (*teste C. C. B.*). Rock Common, 1904, *H.*! Blackdown (near Haslemere). Linchmere. Lavington. Coates. Heyshott. Midhurst. Fittleworth. **E.** Hastings, *C. C. B.*! (Cambridge Rubus hb.!). Lindfield, *Standen*! Bexhill. St. Leonards-on-Sea.

Var. CONJUNGENS Bab. (*cyclophyllus* Lindeb. Lond. Cat. ed. x.). **W.** Graffham, "both on the gault and on the chalk," *M.*! Midhurst Common. **E.** Withyham, 1904, *S.*! and *Waddell*! Westmeston; Poynings, *H.*!

R. BALFOURIANUS Blox. **W.** Hedge close to Rudgwick Churchyard, *W.*! **E.** Turner's Hill, *Britton*! Hartfield, *Waddell*! Lindfield, *Standen*! Near Chailey Station and Winchfield, *H.*! Hurstmonceaux, *Druce*!

R. CÆSIUS Linn. **W.** Rogate, 1900. Sutton. Singleton. Petworth Station. Wick. Lyminster. **E.** Seaford, *Standen*! Uckfield, *F.*! Hailsham to Hempstead, &c., *R.*! Bexhill.

R. CÆSIUS × IDÆUS. **W.** Downs, Madehurst to Bignor, *M.*

R. CORYLIFOLIUS × RUSTICANUS. **W.** Fittleworth to Petworth.

I must not close this article (which is certainly far from exhaustive) without a grateful acknowledgment of help received in its preparation from the many correspondents mentioned in it, and especially from my friends Rev. E. S. Marshall and Messrs. Cumming, Salmon, and White.

LEPIDOZIA SYLVATICA IN BRITAIN.

By W. E. Nicholson.

I HAD for some time thought that *Lepidozia sylvatica* Evans, which is abundant in the United States, and has been recorded from a wide range of localities, from France and Belgium to Bohemia on the Continent, should occur in Britain; but as all the British material which had come to my notice was either completely sterile or had only imperfectly developed female flowers, it seemed safer to refer it to *L. trichoclados* K. Müll., which was already recognized as a British plant.

However, a further search in a locality which, from the account of the species in Europe recently given by Dr. Müller (K. Müll. Rabh. Krypt. Fl. Musc. Hep. p. 291), seemed most likely to produce *L. sylvatica*, resulted in the discovery of a few rather old, but otherwise perfect perianths, which place the identification of the plants bearing them as *L. sylvatica* beyond dispute.

For the convenience of those using Macvicar's *Students'*

Handbook of British Hepatics, I have given below a diagnosis of *L. sylvatica*, which may be compared with his of *L. setacea* (Web.) Mitt. and *L. trichoclados* K. Müll.

LEPIDOZIA SYLVATICA Evans, Notes on New England Hepaticæ, in *Rhodora*, vol. vi. p. 186 (1904) pl. 57.—Dioicous. In green or brownish-green, more or less compact tufts on sand rocks, or moist sandy banks, sometimes mixed with *Cephalozia media* and other hepatics. Stems 2–4 cm. long, filiform, erect or spreading, irregularly pinnate or bipinnate, branches lateral, rarely postical, obliquely or widely spreading, sometimes flagelliferous; rhizoids scarce, mostly on the lower parts of the stems and on the flagella, almost absent above. Leaves transversely inserted, rather distant on the stems, more approximate on the branches, usually widely spreading. Stem leaves deeply trifid or quadrifid to nearly the base, segments 2–3 cells wide below, the apex of a single series of 1–3 cells, the terminal cell acute; cells 14–20 μ long and 11–15 μ wide, walls slightly and uniformly thickened; cuticle smooth, rarely indistinctly verrucose. Under leaves of the stem smaller than the leaves, generally trifid and not infrequently one or two of the segments are reduced to one or two cells in length. Under leaves of the branches smaller, often only bifid. Female inflorescence postical, on a short branch. Involucral tracts much larger than the leaves, innermost ovate, generally bifid from a fourth to a third into two shortly ciliate segments, cells generally longer and thinner-walled than in the leaves. Perianth narrowly ovoid or cylindrical, contracted at the mouth, ciliate, the cilia 1–4 (mostly 3) cells long. Capsule oval, yellowish brown, 0.9 mm. long and 0.5 mm. broad; spores minutely verruculose, yellowish brown, 12 μ in diameter; elaters reddish brown, with two spirals, 9 μ in diameter. Androecia on a short, generally postical, branch; bracts in 4 or 5 pairs, concave, ovate, bifid to about one half, the segments shortly ciliate, bracteoles mostly bifid; antheridia solitary, oval.

Habitat (in Sussex). Moist sandy bank, Eridge Park, *c. per.* Washington Common and Ambersham Common, with female flowers.

The British species of the subgenus *Microlepidozia*, *L. setacea*, *L. trichoclados* and *L. sylvatica* are very closely allied and might perhaps be regarded as belonging to one specific type with three fairly constant races adapted to the somewhat different conditions under which they grow, *L. setacea* being generally a plant of *Sphagnum* bogs, *L. trichoclados* of peat and *L. sylvatica* of sandy ground or rocks.

The newer school of German bryologists, of which perhaps Herr L. Loeske in his "*Grimmiaceæ*" (first part of *Die Laubmoose Europas*, Berlin, 1913) is a typical exponent, complains that the views of Darwin and other writers on evolution, though widely accepted, have found inadequate expression in systematic work, which too often seems to seek to endow a species with an objective reality which theoretically would be denied to it. One must admit the difficulty, and the present plants exemplify it.

In all probability the whole of the Sussex plants which have been referred to *L. trichoclados* will be found to belong to *L. sylvatica*, though in the absence of the rare perianths an exact determination is difficult. The plant found by Mr. Macvicar on peat in the West of Scotland is certainly *L. trichoclados*, so both species occur in the British Isles. *L. sylvatica* may generally be separated from *L. setacea* by the smaller, more spreading leaves with smaller, less papillose cells and, when perianths are present, by the more shortly ciliate bracts and mouth of the perianth. It is separable from *L. trichoclados* by having the bracts and the mouth of the perianth more longly ciliate, in which respect it occupies an almost exactly intermediate position between *L. setacea* and *L. trichoclados*. Prof. Evans attaches importance to the character drawn from the frequently aborted segments in the under leaves of *L. sylvatica*, but this feature seems to be more pronounced in the material from the United States than it is with us. *L. sylvatica*, in the absence of perianths or female bracts, is with difficulty separable from *L. trichoclados*, but the presumption would be in favour of a plant from sandy ground or sand rocks being *L. sylvatica*, and one from peat being *L. trichoclados*. The tufts of *L. trichoclados* are also generally thicker.

L. sylvatica was originally described by Prof. Evans from material from the United States, where it has a wide distribution and appears to be much commoner than *L. setacea*. It has been found by Prof. Douin in France, and Dr. Müller gives many localities in Central Europe, mostly at lower elevations than those affected by *L. trichoclados*.

L. sylvatica is excellently figured by Prof. Evans in his original paper (*loc. cit.*), and the plate is reproduced by Dr. Müller. Figs. 8, 13, 14, 15, 16, 17, 18, 20, and 21 of Plate xlvi. of *L. setacea* in Mr. Pearson's *The Hepaticæ of the British Isles* are taken from American material, and probably relate to *L. sylvatica* rather than *L. setacea*.

SHORT NOTES.

VACCINIUM ULIGINOSUM var. PUBESCENS.—While examining the blueberries in the British Herbarium at the British Museum last spring, I was interested to note two collections of *Vaccinium uliginosum* L. var. *pubescens* Lange (Consp. Fl. Groen. 90 (1880)), not hitherto recorded from the British Isles. One of these, from Sowerby's herbarium, is marked as having served as original of plate 581 (*V. uliginosum*) of *English Botany*: unfortunately it is without further data of any sort. The other plant, collected by E. S. Marshall near Kingshouse, Argyle, June 27th, 1888, affords the first definite locality for the plant in the British Isles. *V. uliginosum* var. *pubescens* is distinguished from the true *V. uliginosum* by the minute spreading more or less dense pubescence of the under leaf surface. It was originally described by Lange from Greenland, and has only recently been recognized

in America (see *Rhodora*, xv. 201 (1913)), where it seems to be common throughout the range of the species.—S. F. Blake.

Melampyrum arvense.—The earliest printed record for the occurrence of this plant in England is 1724, in which year it is recorded in the third edition of Ray's *Synopsis*, p. * 286:—"In the Corn on the right Hand just before you come to Lycham in Norfolk: Mr. J. Sherard." It may be of interest to note that its discovery was made by Petiver and James Sherard in company, during a botanical excursion in East Anglia. Writing to Dr. John Thorpe, "physician at Rochester" (a correspondent of Buddle and friend of Dale), on June 28th, 1716, Petiver says:—"Betwixt this City [Lynn] and Norwich in a corn field we discovered a very beautifull and new plant not found in England before, viz. Melampyrum comâ purpureâ, in flowre" (Sloane MSS. 3340, f. 255).—James Britten.

Juncus balticus Willd. in W. Lancs.—On August 10th, 1914, I had about two hours' collecting at Ansdell, near Lytham, v.-c. 60. Besides other interesting plants, this rush was found in small quantity, associated with *Gentiana baltica* Murbeck and a form of *G. Amarella* L. No doubt more would have been seen, had the available time been longer. Mr. Wheldon tells me that it has occurred in v.-c. 59, S. Lancs.; no other English stations appear to be known.—Edward S. Marshall.

REVIEWS.

Report of the Botanical Exchange Club for 1913. T. Buncle & Co., Market Place, Arbroath, October, 1914. Pp. 439–516. Price 3*s.* 6*d.*

This Report, edited by Mr. A. B. Jackson, the distributor for the year, seems to us of exceptional interest. We note with satisfaction names unfamiliar to us in the list of contributors of specimens, which latter have reached the large number of 8582—the distributor's task has thus been no sinecure!—as well as among the annotators. This is in itself a hopeful sign as an indication that new workers are coming forward, and that the interest of the limited material at their disposal is far from being exhausted. It is pleasant to read that "the material was on the whole well prepared," but the distributor still finds it necessary to impress upon contributors certain elementary truths, which will, we hope, be laid to heart by the (happily but "few") members "who still contribute specimens which are fit only to be burnt." We are glad to see the note appended to a plant which the sender says "is evidently a garden outcast": "Are garden outcasts worth sending for distribution" asks Mr. Jackson.

As usual, critical genera bulk large, and certain plants which have afforded material for discussion almost as long as we remember—e. g. *Thalictrum majus*—still find a place. There is also still the divergence of opinion as to many of the plants which

although natural and indeed inevitable must, we think, be rather puzzling to the novice—the notes under "*Eleocharis palustris* (*?*) *Watsoni*" exemplify our meaning. Matters involving change of name and aliens from rubbish-heaps are, we note with pleasure, comparatively infrequent. Here and there, a practical note, such as that addressed by Mrs. Gregory to violet collectors, affords useful suggestions: we observe, too, that "Dr. Drabble wishes it to be understood that his naming of pansies only refers to the plants actually seen by him"—a wise precaution, in view of the fact that in examples of critical species a mixture not infrequently occurs. *Viola*, by the way, in its two sections, occupies almost as much space as *Hieracium*, these two standing first in quantity. There are signs that *Erophila* is coming to the front as a critical genus—Mr. J. E. Little supplies eight forms, the naming of most of which is doubtful: *Capsella*, too, is attracting attention, though its entry both under that name and the incorrect one of *Bursa* is a little confusing. Mr. C. E. Britton has made a careful study, from authentic specimens, of Mott's proposed varieties: this we venture to extract almost in full:—

"*Capsella Bursa-pastoris* Medic. var. *bifida* Mott. Lower Morden, Surrey, May 6, 1912. This is one of the most distinct forms of *Capsella*, and matches exactly an authentic plant of Mott lent me by Mr. Jackson. It will be noticed that there is a tendency to bear two forms of capsules, but, as the shorter and broader form is on the *primary* stem, this difference is probably due to a variation in the vigour of the plant's vitality dependent on age, and plants of Mott's gathering show a similar peculiarity. Whether this variety is identical with the *bifida* of Crépin is uncertain.

"*Capsella agrestis* Jord. Molesey Hurst, Surrey, May 5, 1912. This plant agrees well with the description of *C. agrestis* in Jordan's *Diagnoses*, p. 339, and, moreover, is identical with Continental plants so labelled in Herb. Mus. Brit. Whilst the *London Catalogue* ignores all varieties of *Capsella Bursa-pastoris*, Mr. Druce, in his *List of British Plants*, gives ten, most of these bearing the same names as Mott's varieties. I am inclined to think that these diverse views are possibly erroneous, and that all the British forms of Shepherd's Purse may be arranged under a small number of forms of the grade of species. Under such an arrangement, Jordan's *C. agrestis* must occupy a prominent place. An examination of type-specimens of Mott's varieties (lent me by Mr. Jackson) show that *densifolia*, *stenocarpa lyrata*, *stenocarpa coronopifolia*, and the form subsequently distinguished as var. *cuneata*, are all too closely allied to each other and to *C. agrestis* Jord. to admit of separation even as sub-varieties. Mott's named examples show that *coronopifolia* differs from *densifolia* only in the form of the radical leaves. The var. *coronopifolia* often has long acuminate or cuspidate segments, and *densifolia* has shorter bluntish segments. In spite of the figures of Mott's paper, there are no differences in the shape of the capsules of these forms, and some examples of Mott's own gathering of these varieties are quite

indistinguishable from each other, either by the form of leaves or capsules. Var. *cuneata* is very well marked by its form of capsule, and perhaps comes closest to Jordan's description of *C. agrestis*.

"*Capsella gracilis* Gren. Towing-path by the Thames below Kingston, Surrey, May 4, 1913. This name, given to forms of *Capsella*, showing more or less incomplete development of the capsule, probably covers plants of diverse origin; some showing non-development owing to climatic conditions, and others in which loss of fertility is due to hybridity. I hesitate to so distinguish any example I send for distribution, but I have reason to believe that *C. gracilis* often represents *C. agrestis* × *C. Bursa-pastoris* var. *bifida*. I have several examples that I so name."

We had marked many more passages for extract or comment, but the limits of space compel the abandonment of this intention. We must therefore content ourselves with having called attention to the Report, again expressing our opinion that it is this year of exceptional interest.

Journal kept by David Douglas during his Travels in North America, 1823–1827: together with a particular description of thirty-three species of American Oaks and eighteen species of Pinus, with appendices containing a List of the Plants introduced by Douglas and an account of his death in 1834. Published under the direction of the Royal Horticultural Society. London: Wesley. Demy 8vo, cloth, pp. 364.

THE information given as above on the title-page (which is disfigured by the addition of the announcement in red ink that the volume is "For Review One Guinea net") of the book before us sufficiently indicates its contents; and the Royal Horticultural Society has done well thus to perpetuate the memory of the most competent of its collectors, to whose efforts at an early stage of its career English gardens were so greatly indebted.

The arrangement of the book is we think open to criticism. It begins with Douglas's Journal in North America from 1823-4; then comes his account of American oaks; this is followed by a sketch of his journey to North-west America (1824–7), and that by his Journal of the expedition, which fills more than two hundred pages; a brief memoir succeeds, and then we have extracts from the Journal of the expedition to the Sandwich Islands, which ended so disastrously in 1834. The letter from the missionaries of Hawaii announcing his death is followed by other matters, among which the most interesting are the full descriptions of American pines, from MSS. only lately discovered, and a list of the plants introduced by Douglas. The book concludes with an admirable index, in the preparation of which and of the volume generally the editor, the Rev. W. Wilks, acknowledges the great assistance rendered by Mr. H. R. Hutchinson, the librarian of the Society.

Mr. Hutchinson is also responsible for the references to the *Index Kewensis*, and here there is cause for complaint. As we

have more than once pointed out, the value of the *Index* greatly depends on its intelligent use: in many instances the synonymy in the present volume is misleading. To take but one example—the western *Pinus canadensis* of the Journal (p. 102) is identified with the eastern *Tsuga canadensis* Veitch—this on the assumption that Douglas's tree was *P. canadensis* L., whereas *P. canadensis* Bong.(= *Tsuga Mertensiana*) was intended by him. Similar cases might be cited—e. g. *Pinus balsamea* on the same page is wrongly identified.

The Journals abound in interesting matter, by no means confined to botanical topics. Douglas was a man of keen observation, and animals as well as plants form the subject of his notes. Atmospherical phenomena are also chronicled, and his description of the ascent of Mouna Kuāh in Hawaii, the frozen summit of which he succeeded in attaining, gives a graphic account of that volcano. In his *Narrative of a Whaling Voyage* in 1833–36, F. D. Bennett mentions his meeting with Douglas in Honoruru shortly after his return from the ascent, and states that "his collection of fossils obtained from the volcanic mountains of Hawaii was large and valuable." Mr. Wilks makes no reference to these collections in his memoir, from which it appears that "several volumes of lunar, chronometrical, magnetical, meteorological, and geographical observations" referring to the Columbia river region and California, "with a volume of field sketches," which are known to have existed, have also been lost.

In one respect the work is disappointing: we refer to the memoir which occupies pp. 295–7. In a book which is practically Douglas's chief monument, this should, we think, have been as full as possible, and should at least have included references to the numerous biographies already existing, some of which are indicated in the *Biographical Index of British Botanists* and show that his work was duly recognized by his contemporaries. In Loudon's *Gardener's Magazine* for June, 1842, will be found a full report of the Douglas Monument Committee formed within two years of his death, whose labours resulted in the erection, in the churchyard of Scone, of a memorial of which a picture as well as a description is given, and which represents the taste of the period: this, with the inscription which accompanies it, might well have been reproduced in the Horticultural Society's volume. The tablet in Honolulu (in the Kawaiahoo Church), with its suitable inscription, is duly mentioned on p. 324. The full account of his early life in the *Companion to the Botanical Magazine* (ii. 29), with the portrait which accompanies it, should both, we think, have been reproduced, and the biography, with a third portrait, in the *Gardener's Magazine* for 1836 should certainly have been mentioned, if only for the interesting fact that it appears in three languages—English, French, and German—in parallel columns. It is also to be regretted that the very interesting letters from Douglas in the Hooker correspondence at Kew have not been included: the high price of the book entitles the purchaser to expect as complete a record of its subject as possible.

BOOK-NOTES, NEWS, &c.

At the meeting of the Linnean Society on February 4th, Dr. Marie C. Stopes, F.L.S., exhibited and described a fossil of doubtful affinity, which was found *in situ* by the exhibitor in the Lower Greensand at Luccomb Chine, in a horizon in which a number of new plants as well as the famous *Bennettites Gibsonianus* have been discovered. The specimen in transverse section of an area of 20 × 35 cm. shows a uniform structure of most beautifully petrified tissue, which appears to be quite unlike any known fossil. Microphotographs were exhibited showing the details of the tissues, which, in many respects, are like a giant phlœm. The name *Vectia luccombensis* is proposed. At the same meeting, Mr. Richard F. Towndrow, of Malvern Link, was elected an Associate of the Society.

The *Times*, which has in so many ways fallen from its former estate, published in its issue of Feb. 13 a "Legend of the Snowdrop," which is an admirable example of spurious or invented folklore. This would of course not matter, if it were not specified as an "old" legend, for it certainly lacks both the sanction and the spirit of antiquity: one had supposed, for instance, that the immediate consequence of the Fall was expulsion from the Garden, and it is news to us that English was the language there employed, though we believe Welsh has put in a claim to be so considered. This is the paragraph:

"According to the old legend, it was after the Fall that Eve sat weeping alone in the Garden of Eden, which was swept with snow and where no flowers bloomed. An angel, seeing her weeping, caught a snowflake in his hand and breathed upon it, and it budded and blossomed into a snowdrop. Where the angel stood there broke out a ring of snowdrops, and the angel said:

'This is an earnest, Eve, to thee
That sun and summer soon shall be.'"

We are glad to see that the *Publisher's Circular* of Feb. 13 takes up the question of the defacement by publishers of books sent for review, against which we have more than once protested in these pages. Except in cases where a notice is more or less dependent upon or connected with the advertisement of the book —and it will hardly be denied that such cases exist—a review entails a certain, often a considerable, amount of work; and the reviewer should be able to put the volume on his shelves or to give it away in an undisfigured state. Even should he sell it, he has given his *quid pro quo*, and is entitled to dispose of it in any way he pleases. The following are the more important passages of the article in question:—

"Some publishers—not all, of course—keep an office boy whose job it is to spoil review copies by stamping violet ink, or perforated, "Compliments" on the title-pages of books going to the editors of the great daily and weekly papers. They send out these ear-marked, defaced copies, apparently under the impression

that the editor is dying to notice their books, and that he has nothing to do but take note of the publisher's wishes . . . . Really this system of defacing copies of books sent out for review is becoming a very serious detriment to the interests of authors and publishers—certainly the former, as they should perceive. A book sent for review is not a present to the editor; it is sent for a consideration. The object of defacing it is supposed to be to prevent its sale by the reviewer at some better price than a defaced copy would fetch. Now, whatever view we in the book trade may take, there is only one view that any self-respecting editor can take, namely, that this is, to say the least, derogatory. There was not quite so much to be said in condemnation of the practice at first, when the defacement was made as delicately as any defacement at all can be done—though the principle is the same—but it has become a 'custom of the trade,' and spread so, that now sixpenny magazines, shilling reviews and ephemeral stuff of all kinds is sent to editors plastered all over 'With compliments' or 'Review Copy,' or 'Gratis Copy.' It is such a short-sighted policy! The publisher wants a good review, so does the author—infinitely more than the publisher does, because the publisher is *blasé* about reviews; it is not his wedding or his funeral; a review more or less, good or bad, does not worry him the length of a cigarette. But the author sits and waits and wonders and wonders, and in the majority of cases does not know that the publisher has defaced the author's child; punched it, perhaps, through half a dozen pages, including title-page and frontispiece; and still, apparently, expects it to find favour in the editor's eyes."

Part 3 of vol. vii. of the *Transactions of the Wagner Free Institute of Science* (Philadelphia, October, 1914) contains a "full and interesting account of the vegetation of South Florida south of 27° 30′ north, exclusive of the Florida Keys." The paper is illustrated by ten plates of various aspects of the vegetation of the region, and is accompanied by a large and useful map.

To the January number (vol. iv. part 3) of the *Journal of Genetics* Mr. Frank C. Miles, of the U. S. Department of Agriculture, contributes "a Genetic and Cytological Study of certain Types of Albinism in Maize." After a summary of previous investigations, the author describes the experimental work which has been conducted in connection with the inheritance of albinism in Maize and gives an anatomical study, illustrated by figures, of the leaves of certain types. An excellent coloured double plate accompanies the memoir.

Our contributor Dr. H. F. Wernham, of the Botanical Department, British Museum, has joined the 28th London Battalion (Artists' Rifles).

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EDITED BY

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"WITCHES' BROOM" AFFECTING BRITISH WILLOWS.

(1) SUMMER STATE; (2) ditto, BISECTED; (3) WINTER STATE.

"WITCHES' BROOMS" ON BRITISH WILLOWS.

By Miller Christy, F.L.S.

(Plate 537.)

I desire to call attention to a very remarkable gall which has appeared on willow trees in this country within the last few years and is apparently spreading, though still confined, I believe, to a very limited area around London; within which area, however, it is already immensely abundant.*

The gall in question is in the nature of the "witches' brooms" so often seen on the birch, and less often on the elm, hazel, hornbeam, and other trees; but this particular "broom" appears on willows, on which trees, I believe, no form of "broom" has hitherto been recorded in this country. Moreover, it develops on the female flower, not on a branch or twig, as in the case of most other of these brooms. It differs also from most other brooms in that, wherever it appears, it seems to develop in great abundance on all willows growing in proximity; whereas most other brooms, though they often appear in great abundance on particular trees (especially the birch), do not often appear in great abundance on a large number of trees growing in proximity to one another. According to Houard,† "witches' brooms" are known on the Continent by names having much the same significance as that used here, namely *wirrzopf*, *hexenbesen*, and *donnerbesen*.

As to the development of the gall, little seems to be known in detail. It begins to develop, however, with the young leaves and flowers early in the spring. I have not yet seen it myself in this earliest stage. Those interested may look for it during the current month.

By the middle or end of May the broom has developed to its full size. At this time, each broom resembles an elongated bunch of moss, two to ten inches in length, and of an olivaceous-green colour, depending from one of the smaller branches of the tree, as represented by the accompanying photograph (fig. 1).

Mr. W. C. Worsdell, who has investigated the structure of one of these brooms in this stage of its development, writes me:—"Each female flower has become excessively hypertrophied. Not only has median proliferation occurred to an exaggerated degree, but lateral branching is also very evident in each flower; so that, where a single flower should normally be, there occurs an inflorescence of a very complex and unusual type, due to the formation of an enormous number of virescent flowers, greatly congested and of various stages of development, at different points on the proliferated main and on the lateral axes of the

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* The gall in question must not be confused with the smaller Rosette Gall, caused by *Cecidomyia rosaria*, which is exceedingly common on *Salix alba* and others species of willow having their branches chiefly erect. The Rosette Gall appears on the twigs only and is always terminal.

† *Les Zoocécidies des Plantes d'Europe et du Bassin de la Mediterranée*, i. p. 132 (1908).

original simple flower (not the catkin)." Mr. Worsdell regards the structure of these brooms as exceedingly remarkable, and intends to continue his investigations, the result of which he will publish later.

This structure may be seen more or less clearly in the further photograph (fig. 2), which shows a broom bisected as nearly as possible along the median line. It will be noticed that the number of incipient virescent flowerets in this broom is very great—much greater than would be produced normally. In some of the larger brooms there must be hundreds, perhaps thousands, of these flowerets; whereas, normally, no more than twenty or thirty would be produced.

As the summer goes on, the abortive floral organs of which the broom is composed begin to dry up. Mr. E. A. Bowles says* that "The growth turns bright red in autumn"; but this I have not seen. Still later, the broom turns quite black and comes to resemble nothing more than a large number of used and shrivelled tea-leaves strung together in a big bunch, as shown in the next photograph (fig. 3). In this state, the brooms continue to hang on the trees, often dozens on each, forming, especially when they are numerous, very conspicuous objects, not unlike birds' nests.

The brooms, or some of them, continue to hang on the trees through the winter and at least until the following summer, when they may be seen hanging side by side with the green new brooms of that summer.

The gall appears to be well known upon the Continent; but as to its range there I have little information. It is met with chiefly, I believe, in Germany, Switzerland, and elsewhere in Central Europe. Mr. F. J. Chittenden informs me that he has received specimens from near Stuttgart, sent by Herr Pfitzer, the nurseryman.†

On the Continent, the gall is attributed to the action of a gall-mite belonging to the genus *Eriophyes* (formerly *Phytoptus*), which has been elaborately monographed by Prof. Alfred Nalepa, of Vienna.‡ Different members of this genus are known to produce witches' brooms on some of the other trees mentioned above. The particular species which is supposed to produce these brooms on the willow has been named *Eriophyes triradiatus* by Prof. Nalepa.§ There are, however, other allied members of the genus (such as *E. salicinus*, *E. tetranothrix*, and *E. rudis*), and Houard mentions several of them as found in these brooms.

According to Prof. Nalepa, the mite is to be found in the gall only when the latter is in the incipient stage. I have myself examined mature brooms without being able to detect either mites,

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* Journ. Roy. Hort. Soc., xxxvi. p. cxvii (1910–11).

† Houard gives (*op. et loc. cit.*) a fairly-good description of the gall, as well as a small and poor figure of it.

‡ See *Zoologische Jahrbücher*, vii. pp. 284–285 (Jena, 1894); Denkschr. Akad. Wiss., Wien, 1900, p. 214, and pl. v. figs. 3 and 4; and *Zoologica*, heft 61 (Stuttgart, 1911), p. 221 and pl. ii. figs. 5*a* and *b*.

§ Anzeiger Akad. Wiss., Wien, 1892, p. 128.

eggs, or cysts. Miss Lister and Miss Hibbert-Ware, who have searched early stages (though, perhaps, not the earliest) have been equally unsuccessful. Mr. E. W. Swanton has, I understand, examined galled flower-buds as early as the middle of March, without finding any traces of mites; and the authorities at Kew have been, I am informed, equally unsuccessful. This disappearance from the gall, apparently at a very early stage, of the supposed originating cause of the development is puzzling, especially when we consider the remarkable size to which the growth afterwards attains. It is possible that, as in the case of some other witches' brooms and other galls, the growth of some parasitical fungus, admitted where the mites have pierced the cortex, may have something to do with this very abnormal development; but no such fungus has been actually observed.

That the gall in question has appeared in this country during the last few years only is proved, I think, by the fact that there is no mention of it in the late Mr. E. T. Connold's books on British Galls,* in Mr. E. A. Fitch's article on "The Galls of Essex,"† in the writings of Miss E. A. Ormerod, in Mr. Swanton's recently published work on the subject,‡ or in any other English works upon the subject of plant-galls. Moreover, the Rev. E. F. Linton, whose *Monograph of the British Willows* (1913) is familiar to most, writes me that the gall in question is quite unknown to him. Prof. A. Henry, of Dublin, and Dr. C. E. Moss, of Cambridge, both inform me that they also are quite unfamiliar with any such gall on British Willows. It is quite inconceivable that so striking a growth could have remained unnoticed by such authorities on British Willows, had it been established long in this country.

As a matter of fact, so far as I have been able to ascertain, it was first noticed in Britain no longer ago than 1906, when, on October 9th, Mr. F. J. Chittenden exhibited examples from Buckhurst Hill, Essex, before a meeting of the Scientific Committee of the Royal Horticultural Society.§ Nearly four years later, on 2nd August 1910, Mr. E. A. Bowles showed before the same body specimens from Enfield.‖ About the same time, Mr. Walter Fox, of Romford, saw examples on a willow at Dagenham, but he did not record the fact. Either then or shortly after, too, the gall was observed on willows growing round the Epping Forest Museum of the Essex Field Club, at Chingford, Essex; and specimens from there, preserved in formalin by Mr. William Cole, about the date indicated, are in the Essex Museum of Natural History at Stratford. Soon after this date, too, Mr. W. C. Worsdell received and examined specimens from Chingford.

I myself first saw the gall on 23rd May 1913, very abundantly, on the many willows growing around the vast reservoirs of the Metropolitan Water Board, at Walthamstow, about four miles

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* *British Vegetable Galls* (1901) and *Plant Galls of Great Britain* (1909).
† Trans. Essex Field Club, ii. pp. 98–156 (1882).
‡ *British Plant Galls* (1912).
§ Journ. Roy. Hort. Soc., xxxii. p. lxxxix (1907).
‖ *Op. cit.*, xxxvi. p. cxvii. (1910–11).

from Chingford; and I saw it again (still more abundantly) at the same place on 18th June 1914. Some specimens gathered at Walthamstow on this date I exhibited before the Linnean Society on December 17th last, when a good deal of interest was shown in them. As a result, I have been favoured with much additional information throwing light on its present distribution in this country. Further, I have since seen the gall in not a few other localities. In several cases, I have seen it from the windows of railway trains, so prominent are the brooms after the leaves have fallen in autumn.

Taking, first, the north side of the Thames (which includes all the localities mentioned above): I may record having seen witches' brooms on willows at Rainham, Barkingside, and Harold Wood, all in Essex. Mr. Walter Fox has sent me specimens from Dagenham, Hornchurch, Harold Wood, and Castle Hedingham, all in the same county; as also is Leytonstone, where Miss G. Lister has observed brooms in great quantities.

Turning next to the county of Middlesex, it is strange to have to record that a tree thickly covered with brooms grows near the eastern end of Red Lion Square, Holborn—a fact kindly pointed out to me by Mr. Hugh Boyd Watt. Mr. William Cole informs me that, within the last year or two, he has seen specimens of the gall from Hornsey. At Highgate, Mr. Watt informs me, it has been noticed in a garden in Tufnell Park and on Dartmouth Park Hill, but not on the West Hill or in Waterlow Park. At Hampstead, it occurs in unusual abundance on a very large number of willows growing on the East Heath and Parliament Hill (as Mr. Hugh Boyd Watt has been good enough to show me), but has not yet extended to the West Heath, the North-west Heath, or Golder's Hill. The appearance of the gall in such striking abundance has naturally excited a good deal of interest among the members of the Hampstead Scientific Society, whose attention was drawn to it by Mr. Watt and Mr. James Burton at one of the Society's meetings in May 1914. At another meeting, on 15th February, additional information was imparted by Mr. Watt, who has taken much interest in the appearance of the broom, and has submitted specimens to the authorities at Kew and to other botanists. He has also published a brief article upon it.* I am indebted to him for much kind help and information.

As to the southern side of the Thames; Mr. Edward Step informs me that he has had the appearance of the gall reported to him from various places in the northern part of Kent. On 30th October last I saw it in very great abundance—say, some scores on each tree—on a large number of willows growing around the station and elsewhere at Eltham.

It will be found on investigation that all these localities, with one exception, lie within a radius of little more than a dozen miles round London, the furthest out being near Harold Wood, fifteen or sixteen miles from the City. The one locality named

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* Trans. Roy. Scott. Arboricultural Soc., xxix. pp. 115–116 (1915)

which lies outside this area is Castle Hedingham, in north Essex, just sixty miles from London. From a willow at this place Mr. Walter Fox has sent me a portion of a gall which appears to be of the kind under consideration; but the fragment is so small that it is difficult to be certain. Assuming that it is so, Castle Hedingham is, so far as I know, the only place in Britain, outside the metropolitan area, at which the gall has been observed as yet. One cannot doubt, however, that it is likely to spread both rapidly and widely.*

Another curious feature in connection with the spread of the gall is its *sudden* appearance in great abundance on all the willows in any one locality. Of this I have heard from various observers. Naturally, such a phenomenon has attracted a good deal of attention and has caused surprise to many people who have seen the brooms without understanding their nature. According to Mr. Hugh Boyd Watt, the brooms first appeared at Highgate in 1911 and at Hampstead in 1912.† The following summer (1913) was that in which they were first seen at many other places. This was the case at Leytonstone, as Miss Lister informs me, and in Red Lion Square, as the custodian tells me. As to the trees round the station at Eltham, Kent, the station-master informs me that they also were first affected in 1913. He tells me, too, that, since the leaves fell in the following autumn, many passengers alighting or waiting on the platform have asked him what kind of birds composed that flock on the trees around; and that, on his bidding them to look again at the supposed birds, they have then asked, "Oh! are they nests, then?" This well illustrates the size and abundance of the galls there. The trees already mentioned at Hornchurch first became affected in the summer of 1914, a fact for which Mr. Walter Fox can vouch.

As to the species of willow on which the gall appears, I can only say that I believe this is usually some form of *Salix fragilis*, the "Open-bark," "Crack," or "Wrong" Willow. The British willows form, however, so highly-critical a group that one hesitates before speaking confidently. Mr. Worsdell believes that the

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* Since the foregoing was put into type, I have heard of the appearance of the gall in several fresh localities. Mr. Harold J. Burkill saw it, in March 1907, at Woodford Green and between Woodford and Snaresbrook. Mr. Percy Thompson saw it in Monk Wood, Epping Forest, in 1907, and says that it has since become frequent throughout the district. It seems probable, indeed, that this district was that in which the gall first appeared in Britain, in either 1906 or 1907. Mr. Dennis saw it in Dean's Yard, Westminster, in 1913; in Battersea Park, in 1914; and on Streatham Common (a single broom only) in the same year. Mr. Gilbert C. Cooke, of Wanstead, writes me that, on 25th December, 1911, he saw the gall on trees near Stroud, Glos.; also that, since that date, his cousin, Mr. W. C. Cooke (a son of the late Dr. M. C. Cooke), has seen it at Gerrard's Cross, Bucks, as well as at Enfield and Wood Green. Mr. Burkill saw it, in January and March 1915, at various places near Hammersmith Bridge, Barnes, and Kew Bridge. These observations extend the area of infection not only to the district immediately west of London (from which I had previously no records), but also to the West of England. It may be that the gall is already much more widely distributed throughout England than I have as yet any idea of.

† Trans. Roy. Scott. Arboricultural Soc., xxix. p. 115 (1915).

specimens from Chingford, which he examined, were from trees of this species. Further, Mr. Walter Fox writes me that the tree at Dagenham from which he collected the specimens mentioned above was *S. fragilis*, and that the galled trees at Hornchurch were in part *S. fragilis* and in part its so-called varieties *britannica* and *russelliana*.

There can be no doubt, however, that the gall appears also on other willows. Prof. Nalepa refers * to its appearance on *S. alba* and *S. babylonica*, as well as on *S. fragilis*. Mr. Hugh Boyd Watt says † that at Hampstead he has observed it on all these, and also on *S. vitellina*.‡ Mr. Chittenden believes that the specimens of the gall submitted to him in 1906 were on *S. alba*.

Whether the gall ever appears on the East Anglian "Close-bark" or "Cricket-bat" Willow (*S. alba* var. *cærulea*) remains to be seen. One thing I can assert, however, with some confidence —it has not yet been observed thereon. I happen to live in mid-Essex, where this particular willow now grows in immense abundance, being cultivated literally as a crop; and I feel sure that, had it occurred thereon, I should have observed the fact. Possibly, however, the absence of the gall may be due to the fact that it has not yet invaded the district in question. At the same time, the twigs of this willow are so slender and so markedly erect that, unlike those of *S. fragilis*, they seem ill-suited to support such large and heavy galls as these brooms.

That the gall, owing to its large size and its great abundance wherever it appears, must have a weakening and generally-prejudicial effect on any willow-trees affected by it can hardly be doubted. Indeed, one at least of the many trees affected by it at Eltham appears to have been killed by it. Again, the tree in Red Lion Square looks as though it might not survive another year, many of its smaller twigs being already dead. It is to be hoped, therefore, that the Bat Willow, a valuable and profitable crop, will prove to be immune from the gall: otherwise a serious economic problem may arise. It is fortunate that *S. fragilis*, the species which seems to be most affected by the gall, is a tree of almost no economic value.

In the extraordinary invasion of England by this remarkable gall, we seem to have a case very similar to the invasion of this country by the well-known Marble Gall (produced by *Cynips kollari*, a hymenopterous insect) on the oak. This mid-European gall was first observed in Britain in 1834, in the neighbourhood of Exeter. The manufacture of cloth was, at that time, largely carried on in that district; and it has been surmised that the Marble Gall may have been introduced there, either accidentally or perhaps experimentally, by someone who hoped to be able to utilize it for dyeing purposes, in place of the somewhat-similar

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* *Op. et loc. cit.* † *Op. et loc. cit.*

‡ On all trees of *Salix babylonica* growing on Hampstead Heath, the brooms assume (as Mr. Watt has pointed out to me) an unusually large but very thin and straggly form, which I have not seen elsewhere.

Aleppo Gall, produced by *Cynips tinctoria*, which was then imported from the Levant in large quantities for dye-making. However this may be, the gall (or, rather, the insect producing it) spread quickly, first over Devonshire (whence it was called at first "the Devonshire Gall") and later over the adjacent counties. In time, it spread still further, until now (as Mr. Edward Connold remarks *) "it may be found on almost every hedgerow where there is oak throughout the whole of Britain." It has become, in fact, one of our very commonest and most widely-distributed galls.

This remarkable invasion naturally excited during its progress a very large amount of interest, and the literature relating to the matter is extensive. During its progress many people became apprehensive lest serious injury might be done to British oaks; but fortunately this fear has not been realized, in spite of the immense abundance of the gall. It is to be hoped, therefore, that the newly-introduced willow gall will prove equally harmless to the British willows.

I am indebted to all those I have mentioned for help and information kindly given. Not least have I to thank Mr. Savage, of the Linnean Society, for the excellent photographs from which my illustrations have been made.

TWO NEW MEXICAN AMARANTHS.

By S. F. Blake, A.M.

Amaranthus annectens. Dioicus ramosus verosim. adscendens vel procumbens ramis elongatis. Caulis crassulus striatus glaber vel ad nodos sparse glanduloso-puberulus. Folia (media et superiora) alterna crassa parva oblonga vel oblongo-spathulata apice truncata vel retusa cuspidata basi in petiolum cuneate angustata ± glutinosa infra valde penninervia (venis ca. 5–6-jugis), lamina 1–1·8 cm. longa 3–4·5 mm. lata. Petioli 4–9 mm. longi submarginati. Spicæ masculæ flexuosæ angustissimæ supra nudæ simplices basi interruptæ folioso-bracteatæ sparsissime ramosæ 1·7 dm. longæ 1·1 cm. crassæ. Calycis masculi 2·3 mm. longi sparse glandulosi sepala 5 ovalia subacuta mucronata scariosa viridi-carinata; stamina 5. Spicæ femineæ flexuosæ angustissimæ simplices vel basi ramosæ nudæ infra interruptæ 7–25 cm. longæ 8–10 mm. crassæ, glomerulis ca. 4–7-floris. Florum femineorum bracteæ 2 minutæ ovali-ovatæ acutæ mucronulatæ 1·3–1·7 mm. longæ; sepala 5 basi incrassata subcoriacea, duobus exterioribus brevioribus late obovato-oblongis retusis cuspidatis scariosis carina viridi angusta ca. 2·2 mm. longis, tribus interioribus equalibus late obovato-spathulatis retusis cuspidatis uninerviis scarioso-marginatis 2·5–2·9 mm. longis; styli 3 vel interdum 2. Utriculus ovoideo-fusiformis biconvexus sub-5-angulatus paullum inflatus leviter ruguloso-striatulus carnoso-coriaceus pallidus indehiscens 3 mm. longus sepala interiora tertia parte superans. Semen

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* *British Oak Galls*, p. 104 (1908).

brunneo-nigrum lucidissimum globoso-ovoideum 1·6–1·7 mm. longum 1·4–1·5 mm. latum.—Yucatan: seashore, Celestun, May 12th, 1868, *A. Schott*, 360 (type in Brit. Mus.).

Amaranthus lepturus. Monoicus erectus ramosus ad 1 m. alta. Caulis tenui salbidus glaber subangulatus. Folia media rhomboideo-ovalia apice obtusa vel retusa cuspidulata basi late cuneata glabra lepidotoideo-rugulosa infra vix pallidiora penninervia (venis 6–7-jugis) 2·1–2·7 cm. longa 1·3–1·6 cm. lata. Petioli angustissime marginati 1·4–2·8 cm. longi. Spicæ erectæ terminales et laterales non paniculatæ floribus maxima ex parte femineis paucis masculis admixtis angustissimæ apice acutæ e paniculis brevissimis glomerulatis multifloris (quarum superiores subapproximatæ nudæ mediæ et inferiores disjunctæ vel remotæ et folioso-bracteatæ sunt) compositæ (1) 2·2–4·1 dm. longæ 6–17 mm. crassæ. Florum masculorum bracteæ 2 subulato-lanceolatæ falcatæ patentes subaristatæ glabræ inæquales virides scarioso-marginatæ longior 3·2 mm. longa; sepala 5 ovato-lanceolata acuta aristato-cuspidata scariosa viridi-carinata extimum ceteris paullo longius 2 mm. longum; stamina 5. Florum femineorum bracteæ 2 lanceolato-subulatæ subaristatæ patentes vel recurvatæ virides scarioso-marginatæ glabræ valde inæquales longior 3 mm. longa; sepala 5 oblongo-spathulata supra subpatentia vel retusa vel obtusa vel interdum (sed extimum semper) subacuta mucronulata glabra vel infra pilis brevibus perpaucis medio viridia scarioso-marginata extimum paullo longius 2·5 mm. longum; styli 3 vel interdum 2. Utriculus calyce multo brevior levis. Semen subcomplanato-subglobosum brunneo-nigrum lucidum 1·2 mm. longum.—Lower California: hills, Magdalena Bay, 1839, *Barclay*, n. 3094 (type in Brit. Mus.).

THREE EARLY JAMAICAN BOTANISTS.

By A. B. Rendle, F.R.S.

In the course of our work on the 'Flora of Jamaica,' Mr. Fawcett and I have had the opportunity of examining a collection of plants made in the island by Dr. Arthur Broughton, a native of Bristol and an M.D. of Edinburgh, who went to Jamaica in 1783, and died there in 1796. His interest in botany found expression in the *Enchiridion Botanicum*, a descriptive list of the genera and species of British plants (1782), and the *Hortus Eastensis*, a Catalogue of the plants cultivated in Mr. East's Botanic Garden in the mountains of Liguanea, in Jamaica (1792; ed. 2, 1794). The collection of plants referred to is in four folio volumes, and bears the date 1786–90. It was formerly in the City Library at Bristol, but is now preserved in the Bristol Museum, and through the kindness of the Curator, Mr. H. Bolton, we have been able to examine it. The plants are mounted in the book-form usual in those days, but are in no systematic order; they are carefully named, and information as to locality is often added.

Dr. Broughton's bequest included some bound volumes of

coloured drawings of the plants and animals found in the island. The drawings are signed Jo. Lindsay, with dates ranging from 1758 to 1771. Many of them are accompanied by careful descriptions, indicating that the author was a keen and somewhat critical student of natural history. The volumes are styled on the back "Elegancies of Jamaica," and evidently represent material for a work on the natural history of Jamaica. Four volumes are extant: vol. ii. contains plants, and the remaining vols. iii., iv., and v. birds, mammals, fish, mollusca and hydrozoa, and insects and amphibia, respectively. The drawings are good representatives of the objects indicated, which in many cases are shown in their natural surroundings. With the volume of drawings of plants is a letter dated May 2, 1775, from Dottingen, in St. Elizabeth, signed Rt. Brown, and addressed to the Rev. John Lindsay, D.D., announcing the despatch of a specimen of the leaves, flower and fruit of the lace-bark tree, and expressing the hope that the book will soon be published.

Through the kindness of Mr. Frank Cundall, F.S.A., secretary of the Institute of Jamaica, we have received the following information :—

John Lindsay, D.D., was ordained in London in 1753, and in 1768 became rector of St. Thomas-ye-Vale, Jamaica, where he officiated until 1773, when he became rector of the Parish Church of St. Catherine in Spanish Town, the present Cathedral. In the same year he received from the University of Edinburgh the title of Doctor of Theology. He remained in Spanish Town until his death "of bile" on November 2nd, 1788.*

The story of the drawings is explained by the following † :—

On the 11th of December, 1770, John Lindsay presented a petition to the House of Assembly as follows :—

"That the petitioner has been engaged, for eleven years past, in the expensive and laborious exercise of collecting drawings of the most curious and beautiful plants, trees, fruits, birds, insects, fishes, &c., of this island; into which pursuit he was chiefly drawn, from the deficiences and incorrectness which to him appeared to be, in the descriptive drawings of former collectors of this kind:

"That the petitioner humbly apprehends nothing can more tend to the satisfaction of the learned, or give the world more just and agreeable ideas of this island, and the West Indies in general, than to see before them a complete proportioned representation of those beautiful articles in the animal and vegetable part of the creation, which most peculiarly adorn and characterise our southern climates:

"That the mutilated sections of botanic writers, in their plates and figures, the petitioner, with great deference, apprehends can give no general satisfaction: and flatters himself he has struck out such a clear description in the forms, proportions, and colouring of his designs, which are represented entire, and actually drawn from

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* *Journal of Institute of Jamaica*, ii. p. 413. † *Tom. cit.*, p. 248.

nature that if published, will yield a satisfaction to foreigners in particular;

"The petitioner also further most humbly sheweth, that his collection will consist of upwards of two hundred copper-plates, of very peculiar workmanship, in two volumes of royal folio, and will be attended with great expense:

"And praying that this house will cause such inquiry and inspection to be made of the premises, as may be necessary, that such report may be made thereof, as to them may seem meet."

It was ordered that the consideration of the said petition be referred to a Committee, who gave Lindsay but cold comfort, reporting on the 13th of December that they have "examined his drawings of the plants, animals, birds, fishes, insects, of this island, and are of opinion, that it is a work of great labour and ingenuity, that the drawings in general are well adapted to convey a proper idea of what they are tended to represent, and will merit the attention of the curious in natural history"; with which report the House agreed, and there the matter seems to have ended.

To *The Gentleman's Magazine* of December, 1781, and December, 1783, Lindsay contributed "An Examination of the Hypothetical Doctrine of Water-Spouts, in Opposition to the Ingenious Speculations of Dr. B. Franklin of Philadelphia, F.R.S., by the Rev. John Lindsay, D.D., Rector of the Parish of St. Catherine, and Town of St. Jago de la Vega, in Jamaica," which was reprinted in the *Journal of the Institute of Jamaica*, vol. ii.

The Rev. John Lindsay must not be confused with John Lindsay,* surgeon and correspondent of Sir Joseph Banks and a friend of Dr. Hope of Edinburgh, who is referred to by Dr. Wm. Wright (*Memoirs*, p. 200) as "a surgeon and expert botanist," who "discovered *Cinchona brachycarpa* in the parish of Westmoreland, Jamaica, in 1785." An account of this plant and of *Quassia polygama*, or bitter-wood of Jamaica, was published by Lindsay in the *Transactions of the Royal Society of Edinburgh* (iii. 205, 1794), of which Society he was elected a Fellow in 1793. That he was a keen observer is shown from his paper read in 1791, entitled an "Account of the Germination and Raising of Ferns from the Seed" (Trans. Linn. Soc. ii. 93, 1794), in which he gives a very clear account of his discovery of the germination of the spore, formation of the prothallium, and development of the young fern. In a later communication (on p. 313) in the form of an extract from a letter to Sir Joseph Banks, dated June 30, 1792, the original of which is in the Banks "Correspondence," Lindsay refers to his successful germination of the farina from the fructification of *Lycopodium annuum* and from the capitula of *Bryum cæspititium*, the latter case confirming, as pointed out in a note by Sir J. E. Smith, Hedwig's previous observations in mosses.

In the *Edinburgh New Philosophical Journal*, ii. 317–9 (1827), are published tables of "Meteorological Observations made in Jamaica by the late John Lindsay, Esq., Surgeon, Jamaica"; and

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* Britten & Boulger, *Biographical Index of British and Irish Botanists*.

it is interesting to note that Lindsay anticipated Dutrochet in his observations on the mechanism of the motion in the leaves of the Sensitive Plant (*Mimosa pudica*). Sir J. E. Smith in his *Introduction to Botany*, ed. vi. p. 33 (1827), refers to a paper by Mr. Lindsay of Jamaica "read long ago to the Royal Society but not published" in which he "thought he demonstrated the medulla in the leaf-stalk of the *Mimosa pudica*, or Sensitive Plant, to be the seat of irritability." In the *Quarterly Journal of Science*, 1827, ii. p. 76, Herbert Mayo, in a communication of some observations on the same subject made by Mr. Burnett and himself, gives some account of Lindsay's researches, which he says "are to be met with in a MS. preserved in the library of the Royal Society, which is dated July, 1790."

In dedicating to him the fern genus *Lindsæa*, Dryander refers to Lindsay as "an assiduous and skilful botanist" (Trans. Linn. Soc. iii. 40). Specimens from Lindsay sent to Banks from Jamaica are contained in the National Herbarium. He died in 1803.

GEDEON BONNIVERT
(fl. 1673–1703).

By James Britten, F.L.S.

In the course of cataloguing the contents of the Sloane Herbarium I came across three volumes (H.S. 84*, 85*, 86*) of plants collected by Gedeon Bonnivert; and on consulting the *Index to the Sloane MSS.* I found so many entries under his name, and these of so various a nature, that it appeared that they would be worth consulting. The result fully justified this anticipation, and is, I think, of sufficient general interest to warrant a more extensive account of Bonnivert than can find place in the catalogue of the Sloane Herbarium. His notes upon Irish plants are of special interest; the two or three specimens preserved in Herb. Sloane, to be referred to later, are, I believe, with the exception of Lhwyd's of a year or two earlier, the first Irish plants extant.

The only record of Bonnivert's origin is on a slip in Sloane MSS. 1000, f. 3: "Gideon Bonnivert* son to Paschall Bonnivert and Judith his Wife born at Sedan in Champaigne."

This is unfortunately undated, and were it not for the dates in his commonplace books, the earliest of which is 1673, we should have no definite record of his existence until 1690, in which year, as we shall see later, he was a trooper in William's III.'s army in Ireland. We do not know when he came to England nor where he received his training and education; his MSS. however show him to have been a highly educated man, of varied tastes and wide reading. They include a large volume (1009) of xv.–xvii. manuscripts of very various description, including many

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* The name is variously spelt by contemporaries "Bonivert" and "Bonavert"; the Christian name is written by himself in his note-book "Gedeon," but his signature is usually "G. Bonnivert."

in his own hand; two commonplace books (1030, 1031), partly in French, partly in Latin, containing fragments of a French novel, of a translation of Petronius, and other matter of miscellaneous character; a pocket-book (1036) written in pencil, with drawings; a folio volume (993) of diagrams of a treatise on the elements of geometry and fortifications; and some "receits for severall diseases" in 1001. The contents of most of these are detailed in the folio incomplete "Catalogus MSS. Bibliothecæ Sloanianæ."

The most interesting of Bonnivert's MSS. is the small volume (1033) described in the folio catalogue as "The journal of Mr. Gedeon Bonnivert, one of a troop of horse dispatched from London to join King William in Ireland; from the 6th of June, 1690, to the end of July of the same year: to which is annexed a brief description of Ireland, accompanied by drawings of several domestic implements used by the native Irish." The "description of Ireland" is justly termed "brief," as it covers little more than a page, and the "journal" only occupies eleven folios.

Bonnivert left London for Ireland on June 6: on his way he "went to meet a friend at Litchfield; about four miles this side of Cosswell there is a stone bridge full of the plant called Maiden hair." He gives a pleasant description of Chester, and on the 29th arrived at Donahadee *en route* for Belfast, "w^{ch} is a large and pretty town, and all along the road you see an arm of the sea on y^{r} left and on the right great high rocky mountains w^{ch} tops are often hiden by the clouds, and at the bottom a very pleasant wood and very full of simples of all sorts." He gives a graphic description of an engagement with James's army, after which he "fell sick of a violent feaver and an extream fit of gout at the same time," and was sent to Dublin. He rejoined the army on July 12, but was again invalided. After the raising of the siege of Limerick he expected to return to England, but was sent to Lurgan: here the diary abruptly ends.

We next hear of Bonnivert at Towcester, Northants, whence (on June 23rd 1696) he wrote to Sloane (4036, f. 264), thanking him for his book (doubtless the *Catalogus* of Jamaica plants which appeared in that year), and describing at length a plant which he had found "in a bogg at y^{e} lefthand going to Kate Sutton" which he could not "find describ'd in Mr. Ray's Synopsis." The elaborate description which follows shows at once that this was *Parnassia*, as Sloane informs him in a letter dated October 15 of the same year (4068, f. 14), mentioning it under its old name *Gramen Parnassi*: "one would not suspect a thing so much differing from all gramina should have that name, but so it is, and you will find it in authors by it." On this Bonnivert comments (4058, f. 45, undated): "I must own that the plant w^{ch} so long did puzzle me is Gramen Parnassi: but who the divell is y^{e} man that knows no more of simples than I, could have look'd for that plant amongst y^{e} Gramina."

In his first letter, in which the *Parnassia* locality is further described as "between Tocester and Borshott," he mentions from

the same locality a small fungus, which, with the *Parnassia* and "other dry'd plants" he had sent to Charleton. Sloane, apparently mistaking the specimen, thought it to be a truffle, and wrote to Bonnivert for its exact locality; Bonnivert replies (4058, f. 45): "You seem to be desirous to know where I found that ball you call Truffle. When I quarter'd at Dorchester in Oxfordshire I crosst the watter about the place where Thame mixes w^th^ Isis, and went a walking in Mr. Dounch's (?) pleasant woods w^ch^ are just tother side of y^e^ Tamise tho' 'tis in Berkshire and in one of those fine walks I found that same thing growing very fast near to another on the stump of a young oak. I am afraid you may be deceived for I am confident it is none of y^e^ Tubera Terræ w^ch^ I know very well, neither by y^e^ smell nor by the tast. I must tell you too S^r^ that I was a little jealous of it till I had cut one in two and tasted of it, but I found it of a very harsh tast much like oak apples. I know very well there are some at Rushton's wilderness, my L^d^ Cullen's house wher I have often been dureing his life. And I was but six weekes ago w^th^ my friend D^r^ Hatton who is since dead, frō whom I had the whole acct. how the same is to be found there. Now S^r^ I think it honnester not to deceive you in y^e^ thing than to side w^th^ the wrong notion." This Mr. Ramsbottom, whom I have consulted, is not able to identify, but I print the note as an evidence of Bonnivert's carefulness.

In September, 1702, Bonnivert went, apparently at short notice, to Dublin, whence he writes to Sloane (4039 f. 21) that he "saw D^r^ Richardson at Hallifax and at his own house, where your health was not fforgott^n^." The crossing from Parkgate occupied twenty days, "by occasion of the storms and contrary winds: twice were we driven to y^e^ Isle of Man, where I had little time to look for things, only I shall tell you that in y^e^ little Town they call Ramsey w^ch^ stands by y^e^ shore side upon all y^e^ walls of y^e^ houses between every stone growes the true Umbilicus Veneris so high that I have measured some 2 foot high. The Pinguicula grows up in y^e^ country very large. I found pretty Sedums but no [ne] very rare."

After leaving the island further perils befel the ship:

"Three nights after we left, two ships in a dark stormy night fell foul of ours on both sides, so that I could compare our ship to nothing better than a nutt ready to be crack'd and we the cornell [kernel], but luckily it happen'd otherwise."

On June 24th Bonnivert writes from Cork to Sloane (f. 153) asking him to use his influence to obtain his promotion to a captaincy. On August 5th he sends from the same place a letter containing much botany as well as notes showing his interest in mineralogy and architecture; upon the walls of Limerick he found *Geranium lucidum*, "a pretty Geranium with shining leaves and a very pretty red flower, the stalk red as corrall and full of acid juice, green all y^e^ winter. Near this Town in a bog call'd by y^e^ name of Douglass grow aboundance of Plants, and amongst 'em a Pentaphyllum rubrum fragiferum [*Potentilla palustris*], aboundance of y^e^ Umbilicus Veneris and Parietaria, several sorts of Sedum, Osmunda Regalis. They digg out of those bogs as I have seen firr trees

wth their boughs and roots very sound timber, and w^{ch} is most admirable is that none of those trees grow in Ireland. . . . I was lately at Kinsale where I saw Captain Dampiere, wth whom I drank y^{rs} and all y^{e} gentlemen of y^{e} Royall Society's health."

Having mentioned a sea creature, "finer a great deal than that I found upon y^{e} sands of Bologne," he continues :—

"I saw by y^{e} old fforts Virga aurea in aboundance, and a very fine fucus w^{ch} Mr. Ray calls I thinke sea girdle and hangers. I have it whole root and all very entire; 'tis as fin'ly furbulow'd as any Lady's Petticoat ab^{t} y^{e} Root, and some part of y^{e} edges; the top ends in severall long leaves. 'Tis a noble plant and I keep it with other things for you. I found another three yards long w^{ch} is composed of severall long threads like small roopes but after I had dried it those roopes became flatt and strip'd; 'tis a very pretty plant. A pretty Sedum verm. min. I found with red flow'rs upon Rocks, but I found amongst y^{e} Rocks abondance of sampier in flower and a fern [*Hymenophyllum*] extraordinary w^{ch} is beautyfull all over and by its shining stalk seems to me a capillery: it grows about an inch and a half broad, beautiful leaves, and is not branch'd but grows in the nature of a Polypodium."

He concludes by an anticipation that his company would be sent to Portugal, where "I hope I shall be better able to satisfy your curiosity than here." The expedition to Portugal, however, did not take place: his last letter (f. 192) is dated from Limerick, September 29th, 1703, and relates to some financial matter in which Sloane had been helpful to him: a reference in this letter shows that Bonnivert was married. On the back of the letter is a note: "I could wish I had along with me a good microscope, one of those glasses that shew the weight of waters and Bauhin's Prodr."

Bonnivert's connection with Sloane and his reference above quoted to "the gentlemen of the Royal Society" indicate that he was on terms of intimacy with the leading men of science of his time. His name does not appear in the list of members, but the fact that he communicated to the Society some "observations on hurricanes" by Captain Langford (Phil. Trans. xx. 407, 1698) shows that his position was recognised. Plukenet, to whom, as we shall see later, he brought specimens on his return from Ireland, speaks of him as "ornatissimus vir" (*Almagestum*, 284, 312); and Petiver (Mus. Pet. n. 405) places him among his "ingenious friends." He also gave plants to Courten (Charlton) who communicated them to Sloane (Herb. Sloane 60 and 82).

The three volumes of Bonnivert's herbarium, although each is preceded by the usual descriptive note in Maty's hand, presumably transcribed from Sloane's missing Catalogue of his collections, seem to have been acquired later than the rest, or in some other exceptional manner; they are intercalated in the series as vols. 84*, 85*, and 86*, and contain none of the usual MS. references to Ray's *Historia*, although it is noted (in 84*) that some of the plants are "perhaps not to be found elsewhere in S. H. S.

collection." Nor are they paged in the usual manner: one (84*) is paged by Bonnivert, the pagination of the others is recent. The contents of the volumes are similar, but their description is different: 84*, to which is prefixed a list in Bonnivert's hand bearing no relation to the contents of the volume, is stated to contain "plants gathered in the fields and gardens of England, mostly of the garden of Leyden from Dr. Herman, &c., by Mr. Bonivert"; 85*, "plants gathered by Mr. Bonivert in Flanders at Breda and at the several camps wherein he was a Lieutenant in the English Army"; 86*, "plants gathered by Mr. Bonivert in the fields and gardens of England, at Chelsea, &c." The small folio sheets are of two sizes, one slightly larger than the other; owing to some confusion, which the unfortunate and irreparable loss of the original Catalogue of the Sloane Herbarium renders it impossible to explain, a small collection (83*) of 26 folios, separately paged, bound at the end of 84*, is described in its title and in the transcribed Catalogue as containing plants from Tangier, &c.; it is however part of Bonnivert's herbarium, corresponding in every particular with the smaller folios (196 sqq.) of 85*.

The specimens are in great part named, usually in ink but sometimes in pencil, in Bonnivert's neat hand, with Latin names and sometimes synonyms, and equivalents in English and French. Very few are localized; a fair proportion are of garden origin, others are common British plants, including those mentioned in the foregoing notes, but there is no indication of their provenance. A specimen of *Thymus Serpyllum* (84* f. 19) is noted as "ex Hibernia"; and to a monstrous form of *Plantago major* (85* f. 116) is added the note, "I had it from Mr. Striker, Apothecary in Breda," who had also given the *Aster* on f. 115; in the same volume (f. 61) is a specimen of hop, labelled "in Flandria" and a *Galium* (f. 109), noted "I had this in Gramont camp." It is, I think, probable that the collection was prepared by Bonnivert when he was settled in England in the later part of his life, and obtained by Sloane at his death, but for this I have no definite evidence.

Other specimens from Bonnivert are scattered through the Sloane Herbarium; H. S. 17, ff. 44, 45, are headed by Sloane, "Plants from Flanders from Mr. Bonivert"; these are mostly if not all duplicates of specimens in his herbarium and include cultivated species. In Plukenet's herbarium (H. S. 97 f. 74) is a specimen of *Potentilla palustris* labelled "Pentaphyllū palustre rubrū majus villosissimis foliis ex Hibernîa D. Bonavert"; this, which he gave to Plukenet on his return from Ireland (Pluk. Alm. 284), represents the gatherings near Cork mentioned in his letter quoted above; on f. 143 of the same volume is a broad leaf of *Ranunculus Flammula*, described by Plukenet (op. cit. 312) as "Ranunculus flammeus latiori Plantaginis folio, marginibus pilosis, ex Hibernîa ab ornatissimo viro D. Gideon Bonivert accepimus"; the *Potentilla* is interesting as being the original of *Phytographia*, t. 212, fig. 2. H. S. 60 and 82 (one volume) contains plants sent by Bonnivert to Courten and by him to Sloane, H. S. 72, and are stated to con-

tain "plants gathered in England" by Bonnivert and others. The volume is composite, and, at any rate in part, is from Courten's collections: ff. 129–134 include specimens labelled by Bonnivert. H. S. 243 is also said to contain English plants collected by him, but I find no labels in his hand.

BIBLIOGRAPHICAL NOTE.

LIX A.—A Bibliographical Puzzle.

In connection with Dr. Jackson's enquiry (p. 67) as to the identity of the "ingenious and worthy Gentleman," to whom Lee in his *Introduction to Botany* acknowledges his indebtedness, reference may be made to a note by Dr. J. E. Gray, which appeared in this Journal for 1872 (p. 374), concerning his rejection in 1822 as a Fellow of the Linnean Society—a rejection which was rendered more bitter in that it was directed against "the grandson of the Mr. Gray who translated the *Philosophia Botanica* of Linnæus for his friend Mr. Lee, whose book first introduced the Swedish botanist's scientific writings to English readers."

The great Gray family of naturalists was descended from Samuel Gray (b. 1694), a seedsman and importer of roots carrying on business in Pall Mall. His youngest son was Edward Whitaker Gray (1748–1806), one of the first Associates of the Linnean Society, and Keeper of the Department of Natural History and Antiquities in the British Museum. Of his eldest son, who bore his father's name and was engaged in the same business, but little is known. He was possessed of considerable scientific knowledge, and it was he who, as has been noted above, assisted Lee in the composition of his *Introduction to Botany*. He died before the birth of his son Samuel Frederick Gray, in 1766, and Lee's "worthy gentleman" is referred to in the second edition of his work (1765) as "the late"—circumstances which support the view that Samuel Gray, the younger, is the subject of Lee's remarks, and that he died in 1765. Samuel Gray's premature death may have decided Lee to republish the *Introduction* otherwise than he had originally intended, sheets A a to F f being suppressed. The suggestion may be hazarded that they were comparable with the "Explanation of Botanic Terms" in edition 3 (1776), which occupies the place of the missing pages in this edition. The "Glossary" is obviously taken from Berkenhout's *Botanical Lexicon*, published in the previous year.

As Lee's *Introduction* was the first work in English to present botanists with the Linnean classification, so S. F. Gray's *Natural Arrangement* (1821) was the pioneer in this country of the classification of Jussieu. Several notes have been written associating various members of the Gray family in the authorship of the latter work, but S. F. Gray must be regarded as the responsible author. A note in the *Kew Bulletin* for 1894 (p. 76) states that it "had apparently been begun by his father": this might readily apply to the introductory matter, but hardly to the systematic portion.

F. G. Wiltshear.

SHORT NOTES.

Helleborus viridis L.—I wish to enquire if anything is known of a form of Green Hellebore in which the sepals are blotched with purple at their base. We have in the vicinity of Bristol a dozen or more stations for the plant, and in one of these only do I find the flowers so marked. I have so far been unable to discover any reference to such a variation in the books I have consulted, including several Continental floras. The flowers are invariably described as pale green, simply. There is a considerable quantity of the plant at the particular station, and the flowers are all marked in this way, but in some the markings are darker than in others.—Ida M. Roper.

Rubus hostilis Muell. & Wirtg. in Cheshire.—Mr. Moyle Rogers so names a pretty little bramble, found by Major A. H. Wolley-Dod and myself, last August, at Oakmere, v.-c. 58, and in roadside hedges between there and Delamere. It does not seem to have been previously known further north than v.-c. 46, Cardigan. Mr. Rogers also identifies, from here, *R. gratus* Focke, for which he had only one Cheshire record. *R. Sprengelii* Whe. is locally plentiful near the Mere.—Edward S. Marshall.

REVIEWS.

Practical Field Botany. By A. R. Horwood, F.L.S. Illustrated with 20 plates and 26 figures in the text. Griffin's Scientific Textbooks. Charles Griffin & Co. 1914. Pp. xv. 193. Small 8vo. Price 5*s.* net.

This volume is very well printed and bound, though its back is not improved by a gilt impression of a weird plant, which I guess to be meant for a poppy, whereas my wife suggests a "mossy" saxifrage. It contains a large amount of useful information, and is well worth the money; the author has read widely, and does not fail to acknowledge his obligation to the many writers from whom he borrows: moreover, he has evidently done a good deal of practical work, both out of doors and indoors.

Yet (I am sorry to have to say so) few botanical books that I have read have caused me so much irritation. Oddly enough, just as I was about to begin this review, a friend who is a very fair all-round naturalist, and devoted to the study of wild flowers although not a collector, came in to see me; he had just bought a copy, and it had made almost exactly the same impression upon each of us.

First and foremost, the title is misleading. No one would suppose that the writer's main subject was ecology, as is at once made clear by his preface. This, of course, is a part, but only a part, of "practical field botany." I have long thought that its importance, though considerable, has latterly been much exaggerated; and that its main value is rather educational and preparatory than intrinsic. In point of fact, every intelligent and

experienced field-worker at plants must, from the very nature of the case, be a working ecologist, though he may not trouble his head about the special terminology, nor draw elaborate maps of small areas on "the gridiron method" (p. 26). *Vixere fortes ante Agamemnona.* One of Mr. Horwood's remarks (p. 106) will suffice to show the somewhat arrogant point of view that he takes:—"A reproach has long lain at the door of systematic botany that it was too formal. But since the birth of ecology [!] it has been possible for the pure systematist to rid himself of this taunt by entering into alliance with this sister subject. For as the one deals with forms and characters of the plants irrespective of environment, or the functions and stimuli evoked by the environment, the other, on the contrary, neglects the form and characters and inquires rather into the nature of the habitat, the life of the plant in the field, and the manner in which that life is influenced by juxtaposition with other plants (a principle unheard of—unthinkable we should almost conclude—in the early days of strictly systematic botany)." This, I maintain, is unfair to old-fashioned collectors, as a body; they use their eyes and their wits to very good purpose, and the suggested rivalry has little, if any, foundation in fact.

The illustrations are uniformly good, although a few of the figures may be superfluous. "How to collect Roses" (pl. ii., fig. A) reproduces a sheet without any barren stem; the "Vegetation of a Pasture" (pl. xi.) gives us a beautiful bit of scenery, but the only recognisable objects in the foreground are cows; the "Vegetation of Heaths and Moors" (pl. xvii.) contains four birches, in spite of the remark:—"Note the absence of trees." However, these are trivial points.

Besides the Appendix and Bibliography (from which the *Journal of Botany* is strangely absent, in spite of its having been the chief record of British Field Botany for more than half a century) the book contains five chapters, which are summarised as follows:—i. The scope, object, and aims of botany; ii. Special methods for collecting plants. iii. Encouragement of the study of botany; iv. Study of the life-history of a plant; v. An outline of plant formations.

Of these, ii. and v. are, on the whole, quite good; i. is instructive, though marred (like the Preface) by the writer's obvious prejudice; iv. is decidedly interesting, but sometimes unduly provocative; iii. is largely irrelevant to the title of the book, and too often the meaning is obscure; it contains an interesting account of the various agencies connected with the preservation of wild plants—a subject with which Mr. Horwood, as Secretary of the Plant Protection Committee, is intimately connected.

Its style is the worst thing in the volume. Not uncommonly the author seems to have preferred using two long words instead of one short word; and the language occasionally becomes so involved as to make the sense confused. Thus it is unhandy as a *textbook.*

Here are some examples. The full heading of chapter iii. runs:—"The necessity for encouraging the study of botany on

economic lines, by the popularization of pure life-histories of plants, through nature study, museums, scientific societies, and other associations, and in the universities." What is intended by "pure life-histories"?

"Ecology has been defined as the topographical physiology of plants. It may be merely descriptive and record real pictures of the vegetation, or be also experimental, or etiological, and arrive later at the causes of the distribution of plants on a small or large scale at any definite spot, and explain the relationship of the arrangements between themselves and to the edaphic factors of soil, climate, &c." (p. 24).

"Many plants have real medical properties shorn of the absurd superstitions of the past, and a knowledge of these is essential to any student of plants, being to-day increasingly important" (p. 30).

"There are many reasons for establishing a section in the garden of wild flowers" (p. 31).

"Collecting in this way is a useful means to an end, which need not be overdone by children if engaged in a wild flower competition, as they may be, without running any risk of diminishing appreciably the numbers of a plant. Children, moreover, like to study wild flowers out of doors in the open air without necessarily plucking them" (p. 80). Do they?

A saving sense of humour would have spared us such truisms as these:—"Flax is derived from the flax" (p. 121); "Sedges contribute to form sedge moor" (p. 159); "The plants that are found on bare rocks and walls are those that flourish in little or no soil" (p. 171); "Fodder is furnished for cattle and horses by a number of plants, *e. g.* Clover. . . . Timber is afforded by our forest trees, and is the basis of one of our great industries" (p. 121).

Though facts are, as a rule, correctly stated, a few assertions are open to question, *e. g.*:—"This work is restricted to field botany, from a broad and popular point of view" (p. vii.). "It is true that here and there in a large garden a copse [*sic*] of hazels is found, but they are grown, not for their natural beauty, but for the filberts which figure in dessert" (p. 32). Is, then, the filbert conspecific with *Corylus Avellana*? "The superstitious have been led to say Beech is exempt from this" [lightning] (p. 36). One can believe so, from observation, without being open to the charge of superstition; the smooth bark may account for its apparent immunity.

"Jawbreaking" terms are too freely used. Among others we find "oxylophites"—a vile word, which has no true Greek derivation; "chersophytes"; "the Arctic alpine chomophyte formation"—coming as it does from χῶμα (a mound or rubbish heap), this, if retained, should be "chomatophyte."

Chapter ii., though it contains many useful and some novel suggestions, rather "teaches one's grandmother"; everybody knows that strong boots and good sight are essential for field-work. The outfit recommended is needlessly large and cumbrous; "necessary" might often, with advantage, be replaced by "useful." The proposed details for herbarium labels are simply appalling;

one who has often distributed two or three thousand sheets in a year could not possibly use them all. And I think that nobody, even if he devoted the whole of his time to botanical pursuits, would be able to carry out all the author's instructions. *Non omnia possumus omnes.*

Two Supplements to the *Index Kewensis* have appeared since 1895, bringing it down to 1905.

In conclusion, I wish to insist very strongly on this point: there is no ground for quarrel between ordinary collectors and "pure" ecologists; they should, rather, aim at co-operation and co-ordination. My criticism is, perhaps, severe; but it is honest and without malice. Mr. Horwood has "the root of the matter" in him; if he will use simpler language and refrain from being unduly combative, we may hope for better products of his pen.

EDWARD S. MARSHALL.

Flora of Jamaica, containing Descriptions of the Flowering Plants known from the Island. By WILLIAM FAWCETT, B.Sc., F.L.S., and ALFRED BARTON RENDLE, D.Sc., F.R.S. Vol. iii. Piperaceæ to Connaraceæ. 8vo, cloth, pp. xxiv. 280. With 113 text-illustrations and 5 plates. Trustees of the British Museum: Longmans, &c. 1914. Price 15*s.*

THE first volume of this work, containing the Orchidaceæ, was noticed in this Journal for 1911 (p. 172); the second volume, which will complete the Monocotyledons, is delayed, so that the present, although numbered vol. iii., is the second in point of issue. The general plan of the work was indicated in the review indicated above, but the present volume differs in certain particulars from that already noticed—notably in the insertion in the text of small but very useful figures illustrating each genus. This is a commendable innovation upon the plan hitherto adopted in colonial floras, and greatly adds to their usefulness.

The arrangement of the orders, thirty-eight in number, is that of Engler and Prantl; this no doubt is wise, as that arrangement is coming into general use, but to old-fashioned folk of the "Bentham and Hooker" school it is somewhat puzzling to find *Caryophyllaceæ* succeeded by *Nymphæaceæ*, and *Ceratophyllaceæ* occupying a position between that and *Ranunculaceæ*. An excellent "conspectus of families," however, helps to make this intelligible; there is also a "key" in which the families are indicated by their numbers: we think their names should also have been given, so as to avoid the trouble of turning to the conspectus. The extensive list of "works referred to in the text" shows that the literature bearing on the Flora has been exhaustively investigated. In the preface special mention is made of the collections of Arthur Broughton made in 1783–96 and of the very interesting series of drawings (1761–69) of the Rev. John Lindsay, of whom and of another botanist who has been confused with him Dr. Rendle gives some account in our present issue (p. 104): these were lent by the Bristol Museum, where they are deposited.

Glancing through the pages, one notes the predominance of

certain genera unrepresented in these islands, whose elaboration cannot have been an easy task. There are 38 species of *Peperomia* and 14 of *Piper*; 11 of *Ficus*, three of them new, from Dr. Britton's MSS.; 42 of *Pilea*, several of which were published in this Journal for 1912, with a plate which is here redrawn, and one new species; and 19 of *Coccoloba*. The *Cruciferæ* are almost confined to common weeds; we note by the way that the Watercress appears as *Nasturtium fontanum* Asch., a name new to British books, resulting from the fact that its earliest name, after Linnæus, is *Cardamine fontana* Lam. (1786): the trivial of Linnæus, who called it *Sisymbrium Nasturtium-aquaticum*, cannot be retained under *Nasturtium*.

Very full use has been made of the old collections, of which Sloane's is the chief, in the National Herbarium, and the synonyms from early literature are quoted in full: these are even included in the excellent (and, we are glad to note, *single*) index. The whereabouts of type specimens is carefully indicated, though we think the term hardly applies to Von Rohr's example of *Aristolochia ringens* in the British Museum. It would perhaps have been better, when, as in the case of Casimir de Candolle, the same author is responsible for two works, to give full reference to each whenever it is quoted. We note by the way that "tom. cit." is sometimes employed instead of "op. cit."—this strikes us as a new abbreviation, and there seems no reason why both should be used.

It remains to be said that every page bears evidence to the care with which the work has been executed, and that the volume is admirably produced; the typographical arrangement seems to us excellent. It is anticipated that the Dicotyledons will occupy three more volumes, thus completing the work in six.

BOOK-NOTES, NEWS, &c.

At the meeting of the Linnean Society on February 18th, 1915, Mr. Harold Wager gave an account of his recent researches upon "The Action of Light upon Chlorophyll," illustrating his remarks with lantern-slides, many being autochromes. He stated that the chemical changes produced by light on the green leaf, sugar and starch being evolved from carbon dioxide and water, are still obscure. By making a film of chlorophyll upon paper and on glass, by floating an alcoholic solution and allowing it to dry, he was able to bleach a portion under strong sunlight, and covering a portion by black paper; when this was tested by Schiff's solution, the exposed, that is bleached, portion became pink, the unexposed portion showing no colour change. Another experiment was made by subjecting similarly bleached portions of chlorophyll to the action of potassium iodide, when the exposed parts turned reddish blue, in consequence of the liberation of iodine, which acts upon the starch on the paper. It was then tried whether the solution of chlorophyll itself gave the reaction. Four test-tubes were partly filled with a solution of chlorophyll in petroleum ether and corked; two were exposed to light and

two kept in the dark; reactions confirmed the previous results. These experiments clearly show that the decomposition of chlorophyll is accompanied by the formation of an aldehyde and of something able to oxidize the potassium iodide and to set free the iodine. If the chlorophyll papers are exposed behind coloured filters, we find that both the aldehyde and the potassium iodide reaction are much stronger in the red than in the blue, and are weakest in the green, but if the exposure behind the green and blue is prolonged to eight or ten times that of the red, the reaction in the blue becomes as strong as that in the red. Instead of alcoholic extract of chlorophyll we may use dried leaves, or chlorophyll expressed from leaves, or layers of *Euglena*, or algæ spread over the paper. The reactions also take place inside a leaf, if the bleaching has been efficient. Thus if sunlight is condensed by a lens upon a living leaf of *Oxalis Acetosella* containing plenty of starch, the chlorophyll is bleached in a small area, and if treated with Schiff's solution, a strong aldehyde reaction results; if tested with potassium iodide the said area becomes blue. It having been stated that formaldehyde is produced when chlorophyll is exposed to sunlight in the presence of carbon dioxide, an attempt was made to determine whether such was the case in the present series of experiments, but the author was not able to satisfy himself on this point, though several of the tests succeeded even with so small an amount as one-millionth of formaldehyde. Hydrogen peroxide had been suggested as the gaseous oxidising compound of chlorophyll, but the result of many varied tests showed that this was not so. Further experiments were detailed, as those on chlorophyll in *Laminaria*; that photo-decomposition of chlorophyll takes place only in the presence of oxygen; that carbon dioxide need not be present to cause photo-decomposition of chlorophyll; and the action of light upon the green and yellow pigments of chlorophyll—the yellow pigment bleached rapidly, the green much more slowly. There is evidence to show that the reactions described in this paper are not due to the chlorophyll pigments only, but that other substances are present, associated especially with the carotin and xanthophyll upon which the activity of the chlorophyll partly depends.

At the meeting of the Linnean Society on March 4th, Mr. A. W. Hill exhibited specimens of the Cucurbitaceous genus *Marah*, with its remarkable germination. He stated that the genus *Marah* includes some eleven species practically confined to the Pacific watershed of the W. States of N. America and the islands of Lower California. The genus is distinguished from *Echinocystis* and other genera with similar floral characters by its enormous tuberous root, associated with which is the peculiar mode of germination of the seeds. The petioles are fused to form a tube, and on germination this tube grows out, carrying plumule and radicle some distance into the ground, the cotyledons remaining hypogeal. The plumule finally bursts through the petiolar tube, and grows up into the air with sharply bent-over

tip. The petiolar tube is covered with hairs which appear to function as root-hairs. In *M. fabaceus* the tube is very short, but in the other species examined, including the classic case of *Megarrhiza californica* (probably *Marah macrocarpus*), described by Asa Gray and Charles Darwin, the petiolar tube may be as much as 6 inches long. In *M. horridus*, the seeds of which species were sent to Kew by Mr. F. R. S. Balfour, of Dawyck, the petiolar tube not only splits into its two halves but the petioles further split into three strands, each containing a vascular bundle, and each strand appears to be responsible for the building up of a definite portion of the tuber.

At the same meeting Dr. Stapf exhibited inflorescences of the Carob tree (*Ceratonia Siliqua*), representing the several sexual conditions in which the tree occurs. He also gave an account of Cavanilles's observations in the Carob groves of Valencia and the work done by Heckel and Schlagdenhauffen on the French Riviera, and by Gennadius in Cyprus. According to these authors most of the apparently female trees, that is, trees with very small subsessile anthers, are in reality hermaphrodite (brachystemonous hermaphrodites in contradistinction from the rare dolichostemonous hermaphrodites). But Dr. Stapf pointed out that no anthers containing pollen could be found in the "brachystemonous" specimens in the Kew Herbarium, in spirit material recently received from the Italian Riviera, and in preparations of such flowers obtained from Cyprus. In spite of Heckel's, Schlagdenhauffen's, and Gennadius's excellent work, there is still some mystery surrounding the pollination of the Carob tree, which is certainly worth studying on the spot.

The *Annals of the Missouri Garden* is hardly the place where we should expect to find a paper on "Some Œnotheras from Cheshire and Lancashire," so we think British botanists will thank us for calling their attention to it. Mr. R. R. Gates deals at length with the plants, which have already received attention from American botanists and everywhere appear "to be spreading, although children gather the flowering shoots in armfuls," being most abundant at St. Anne's-on-Sea. Mr. Gates has cultivated many of the "races," and describes at length *Œ. multiflora*, *Œ. rubrinervoides*, *Œ. tardiflora* and *Œ. rubritincta*; these, although "not pure species nor even true-breeding races, are undoubtedly as diverse from each other as average species: many systematic species if bred experimentally would probably not breed truer within narrower limits than these races have done." The paper is illustrated by three plates, in which are figured various stages of the forms mentioned.

The number of the *Annals* in which the paper appears presents certain bibliographical peculiarities. It is dated on the cover and on the first page "November 1914," and contains a titlepage and index for "Vol. i. 1914," of which it forms a part. But to Dr. Gates's paper and three others is appended a footnote: "Issued January 30, 1915," although a fifth paper, and that the last in the number, bears no such intimation! No indication is

given anywhere in the matter introductory to the volume that the date on the titlepage is incorrect, and there is thus danger that an unwary bibliographer may assign a wrong date of publication to the new species contained in the number. The ingenuity often manifested in laying traps for future bibliographers is as remarkable as it is regrettable.

It is good news that *The Potamogetons of the British Isles*, which was left unfinished by its author, the late Alfred Fryer, has been concluded by Mr. Arthur Bennett, and that the complete work will be issued by Messrs. Lovell Reeve at an early date. This fifth section will be entirely new, as Mr. Fryer left no notes for it, and it is fortunate that so competent a successor as Mr. Bennett has been available for the completion of the work: the eleven additional plates illustrating this section have been drawn by Miss Matilda Smith.

Until one of Mrs. Florence L. Barclay's heroes went there and slept under it (with serious results), the Upas tree was not known from the African Continent; and until Mr. Kefford went to Vauna Levu, orchids were unknown in Fiji. This we state on the authority of Mr. Kefford himself, whose adventures in search of orchids, crowned with success by the discovery of the appropriately named *Corona Keffordi*, are narrated by Mr. Ralph Stock in the *Windsor Magazine* for March. Another collector had been "egged on by a promise of one thousand pounds to find a new variety," and was nearly successful in depriving Mr. Kefford of his crown—we mean his *Corona*. Mr. Kefford had the proper collector's instinct: he told his rival's employer that "if [he] found an unknown species, it would be a physical impossibility for [him] to part with it for fifty thousand"; which seems to suggest that he intended to swallow the plant and to defy the strongest emetic. "I caught sight of something white above my head among the branches of a *ti* tree: it was the *Corona Keffordi*" . . . "a delicate waxen thing drooping from a stalk embedded in the ti tree bark." The plant was at once named by the collector after himself, the "crown formation" indicating that it was previously unknown—and apparently unique, for "one might search those swamps for a year and not find this one's duplicate—but even then it would not be the *Corona Keffordi*." The other man congratulated himself "upon a variety of the Odontoglossum, but the lip is pink instead of chocolate-coloured," so it would seem that orchids are by no means absent from Fiji, as indeed Mr. Kefford might have ascertained had he consulted the *Flora Vitiensis* before starting on his quest. We fear that, until a fuller description is published, the name will have to be regarded as a *nomen nudum*, but we shall be glad to print a fuller account of the plant when it reaches the National Herbarium. Meanwhile it must be regarded as an interesting addition to the not inconsiderable flora of fiction, in which Lord Beaconsfield's Stephanopolis and Rose of Jericho—the latter, if we recollect aright, carried in a Roman procession—published in *Lothair* will find a place beside some of Mr. H. G. Wells's creations.

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EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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OPHRYS × OLBIENSIS. OPHRYS × KELLERI. H. M. Godfery del.

A NEW HYBRID OPHRYS.

By Colonel M. J. Godfery.

(Plate 538.)

Ophrys × Kelleri Godfery, hybr. nov. (*O. arachnitiformis* Gren. & Phil. × *O. atrata*). Tuberibus ovato-oblongis altero sessili altero pedifero, foliis rosulatis late ovatis obtusis ultimo caulino amplexicauli, spicis laxe paucifloris, bracteis ovario æquilongis, sepalis oblongis obtusis patentibus, petalis sepalis brevioribus oblongis obtusis margine sinuatis fuscis sub lente subtiliter brunneo-velutinis, labello trilobo lobis lateralibus angustis lobo intermedio lato profunde emarginato castaneo-velutino basi scuto glabro prædito, rostello brevi obtuso.

Bulbs ovate oblong, one sessile, one stalked. Leaves in a flat rosette adpressed to the ground, broadly ovate obtuse grey-green, one upper leaf just above rosette ovate amplexicaul spreading. Stem erect, 20 cm. Flowers four, in a lax spike. Bracts sheathing green, equal to ovary. Outer divisions of perianth oblong obtuse, spreading, rather long. Two upper inner divisions oblong, two-thirds as long as outer divisions, obtuse sinuate-edged pinkish brown dark in colour; under a strong lens, velvety with dense short hairs. Labellum trifid, lateral lobes narrow, densely hairy like those of *atrata* median, lobe broad, deeply emarginate, almost bilobed; lobes rounded at apex, rich chestnut-brown, velvety, with a glabrous shield at the base. Beak short, obtuse.

This plant was found on March 24th, 1914, among a small colony of *O. arachnitiformis* on a thinly wooded hillside of the Mont des Oiseaux, at Hyères. *O. atrata* was frequent in the neighbourhood. The flat rosette of leaves, the long pale sepals, the dark colour of the upper petals, the trilobed labellum with its densely hairy shoulders, give a striking character to its appearance.

When I showed this specimen to Mr. Raine, who has done so much for the botany of the Var, he said it suggested *O. atrata* to him. At first I did not agree, the much-divided labellum turning my thoughts in other directions. After careful study and comparison with specimens of *atrata*, however, I came to the same conclusion. I have named it in honour of Dr. Gottfried Keller, of Aarau, Switzerland, who agrees in regarding it as new, and whose great work on the Ground Orchids of Europe it is hoped will not be long delayed by the war.

For convenience of reference it may be well to reprint here (from Journ. Bot. 1914, 271) the description of *O.* × *olbiensis*, which is also represented on the accompanying plate:—"Folio summo caulem vaginante acuto, spica laxa floribus pluribus distantibus, bracteis ovarium multo excedentibus acutis, sepalis lineari-oblongis obtusis reflexis, petalis sepala semiæquantibus glabris, labello sepalis breviore ovato trilobo emarginato apice appendice parvula basique mammillis 2 prominentibus externe dense velutinis instructo saturate purpureo-brunneo maculo scutiformi utrinque emarginato notato."

NOTES ON SOMERSET PLANTS FOR 1914.

By Rev. E. S. Marshall, M.A., F.L.S.

The following occurrences are additional to my Supplement to the *Flora of Somerset*, published last year. A season which seemed likely to prove quite a good one was curtailed by the outbreak of the great war, which practically put an end to botanical excursions.

Major A. H. Wolley-Dod spent part of July at Minehead; although he collected little, he sent me a long and very valuable list of stations from this neighbourhood: his initials are appended to his records, and the passages in inverted commas are taken from his list. Districts 1, 2, 4, 6 are in v.-c. 5 S. Somerset; the rest belong to v.-c. 6 N. Somerset. New records for either are starred.

Berberis vulgaris L. 2. Hedge above Ellicombe; "doubtless planted," *W.-D.*

Corydalis claviculata DC. Wood behind Timberscombe Church, *W.-D.*

Fumaria Boræi Jord. Timberscombe, *W.-D.*—*F. Bastardi* (*confusa* Jord.). Ascent of Wootton Common from Timberscombe, *W.-D.*

Nasturtium officinale Br. var. *siifolium* Reichb. 2. Very fine, below Bratton, *W.-D.*

Barbarea verna Ascherson. 2. Casual, King Edward's Road, Minehead, *W.-D.*

Hesperis matronalis L. 1. Established at Hartford, in the Haddeo valley, *W. D. Miller*!

Brassica nigra Koch. 2. Native on the coast, Stolford to Shurton Bars.

Coronopus didymus Pers. 2. "Seen too commonly all over the Minehead district to note exact stations; *C. procumbens* Gilib. seems about equally common," *W.-D.*

Reseda Luteola L. 2. Slopes above Wootton Courtney, *W.-D.*

Viola palustris L. 2. Hannay Combe, Dunkery, *W.-D.*—*V. sylvestris* Kit. "Roadside, below Roadwater. Spur compressed, conical, deep violet. Petals deep violet, running out to edge of petals. Upper leaves subreniform, with triangular point" . . . *W.-D.* Probably a variety of this, tending towards *V. Riviniana* in foliage. A rare species in S.W. Somerset.

Polygala vulgaris L. 1. "Only once seen, by the old railway on the Brendon Hills; *P. serpyllacea* Weihe seems frequent and general," *W.-D.*

Saponaria officinalis L. 2. Sandhills on the shore near Dunster, *W.-D.*

Silene noctiflora L. 8. In several fields on Green's Combe Farm (Upper Oolite), Milton Clevedon; profusely, in one.

Lychnis alba Miller. 2. "With *pink* flowers (not, I think, a hybrid), in an old quarry at Alcombe," *W.-D.*

Arenaria peploides L. 2. Shore, east of Dunster, *W.-D.*

Sagina ciliata Fr. 2. Above Alcombe, *W.-D.*—*S. subulata* Presl. 2. Ascent of Dunkery, a little above Ford; near Timberscombe, *W.-D.* This species was accidentally omitted from the Supplement.

Spergularia marginata Kittel. 2. West of Stolford.

Hypericum Androsæmum L. 2. Lane between Luxborough and Kingsbridge; near Leighland Chapel, *W.-D.* Lower Merridge.—*H. humifusum* L. 2. Dunkery Hill; Brendon Hills, *W.-D.* 6. Chard Common, *W. Watson.*—*H. hirsutum* L. 2. "Does not seem to reach Minehead, but is common from Washford eastwards" [*i.e.* on the Lias], *W.-D.*

Lavatera arborea L. 9. I believe this to be a true native on the Steep Holm cliffs.

Malva moschata L. 2. Wood at Tivington; quite frequent in the Roadwater valley, *W.-D.*—*M. rotundifolia* L. Alcombe, *W.-D.*

Linum bienne Miller (*angustifolium* Huds.). 2. Railside between Washford and Roadwater, *W.-D.*

Geranium lucidum L. 2. "Common enough in lanes on low ground, but hardly strays from them; and not very evenly spaced.—*G. columbinum* L. is common, and very general; hardly worth naming stations," *W.-D.*

Erodium moschatum L'Hérit. 2. Common on Minehead Warren; reaching beyond Dunster, *W.-D.*

Ulex Gallii Planchon. 2. "Surely the prevailing species on all the moorland (Dulverton to Brendon)," *W.-D.*

Cytisus scoparius Link. 2. "Too common to locate, at least, all along the Roadwater Valley; Brendon Hills; Timberscombe; Wootton Courtney," *W.-D.*

Trifolium arvense L. 2. Cultivated field above Alcombe, *W.-D.*—*T. scabrum* L. 2. Coast near Stolford.—*T. hybridum* L. 2. "Seems frequent enough" [about Minehead], *W.-D.*—*T. repens* L. var.* *rubescens* Seringe (var. *Townsendii* Bab.)? 2. "With *rose* flowers, is quite common in marshes about Minehead; also inland, even in shady places—showing that it is not a sunburnt form," *W.-D.* I have seen no specimen; but this determination is almost certainly right.—*T. filiforme* L. 2. Lane above Alcombe; ascent of Dunkery Hill, *W.-D.*—[*T. agrarium* L. (*T. aureum* Poll.). 2. In a sown grassfield near Croydon Hall, *W.-D.*; not previously recorded as a Somerset casual.]

Anthyllis Vulneraria L. 2. Frequent by the old railway, from Washford almost to the foot of the incline to the Brendon Hills, *W.-D.*

Vicia hirsuta L. "Too common to locate?" *W.-D.* He only observed *V. tetrasperma* Moench near Hopcott, district 2.—*V. sylvatica* L. 2. Wood by the railway, near Roadwater, *W.-D.* 5. Aller Wood, *W. Watson.*

Lathyrus Nissolia L. 2. Railside near Roadwater, *W.-D.*—*L. latifolius* (a garden escape) also occurred.—*L. montanus* Bernh. 2. Incline of the old railway, ascending the Brendon Hills, *W.-D.*

Rubus idæus L. 1. Plentiful on the old railway, summit of Brendon, *W.-D.* 2. "Common, wherever I have been," *W.-D.*

Alchemilla vulgaris L. (aggregate). 2. Luxborough, *W.-D.*; most likely *A. minor*.—*A. pratensis* L. "Is reported from v.-c. 5; but I have seen no specimens so far," *C. E. Salmon, in litt.*—**A. alpestris* Schmidt. 10. "Near Bath, 1837; in Herb. Edin.," *R. C. Alexander, do.* A very rare plant in the south.—*A. minor* Huds. 2. Lower Merridge.

Poterium Sanguisorba L. 2. Old railway, about and above Roadwater, rather plentifully, *W.-D.*

Rosa spinosissima L. 2. "One bush, on the railway at Lower Roadwater; but almost certainly a garden escape," *W.-D.* Perhaps bird-sown; it occurs as a native about Blue Anchor and Watchet.—*R. micrantha* Sm. 2. "Certainly very general; usually in single bushes, wherever I have been, but hardly 'common.' Wootton Courtney; shore at Dunster; Roadwater; many other places not noted," *W.-D.* Coast, Lilstock.—*R. canina* L. var. **sphæroidea* (Rip.). 2. Roadside, Dunster Station, *W.-D.* First record for the county; but probably not distinguished from the following:—Var. **sphærica* (Gren.). 2. Near Bratton; near Leighland Chapel; hedge below Perriton, *W.-D.*—Var. *senticosa* (Ach.). 2. Roadside near the Polo-ground, Dunster, *W.-D.*—Var. *aspernata* (Déséglise). 2. Woodcombe; roadside near Dunster Station, *W.-D.*—*R. dumetorum* Thuill. 2. Hopcott, *W.-D.*; as *R. submitis* Gren., which I think means what we call "type."—*R. stylosa* Desv., var. *systyla* (Bast.). 2. Roadside below Woodcombe; lane near Cowbridge, Timberscombe, *W.-D.*

Pyrus latifolia Syme, var. *decipiens* (Bechst.). 2. I have long known several trees, mostly inaccessible, on the coast cliffs below Greenaleigh Wood. Last June, Mr. J. W. White and I found one of them in good flower, within reach; it has much narrower leaves than the usual Minehead form, thus approaching *P. salicifolia* (*rupicola* Syme); but I have not seen that nearer than Culbone, and do not think that the plants in question are hybrids.

Chrysosplenium oppositifolium L. 2. Lower Merridge; Stogumber.—*C. alternifolium* L. 2. Stream-sides, below Stogumber Station.

Cotyledon Umbilicus L. 2. "Much too common about the whole district (which I have visited) to need special stations," *W.-D.* This remark applies equally to the hilly parts of districts 1 and 3, at least on non-calcareous soil. Major Wolley-Dod considers *Sedum anglicum* Huds. still commoner (in district 2); but it is still unknown outside the south-west of the county.

Drosera rotundifolia L. 2. "In several places on the hills above Alcombe and Ellicombe; fairly frequent on the moors and valleys, but not at all common," *W.-D.*

Lythrum Salicaria L. 2. Roadwater valley, in several places; Bishop's Lydeard! *W.-D.*

Epilobium angustifolium L. 1, 2. Very common by the old railway on the summit of Brendon; here and there in the Roadwater valley, *W.-D.*—*E. tetragonum* Curt. 2. Coast below Shurton.

Hydrocotyle vulgaris L. 2. "Too common in all marshy spots to specify," *W.-D.*

Smyrnium Olusatrum L. 2. Lane between Dunster and Alcombe, *W.-D.*

Apium graveolens L. 2. Marshes, Minehead to Blue Anchor, *W.-D.*—*A. nodiflorum* Reichb. fil., var. *pseudo-repens* Watson (*ochreatum* Bab., non DC.). 2. "Abundant everywhere," *W.-D.*

Sison Amomum L. 2. "Too general to specify stations," *W.-D.*

Pimpinella Saxifraga L., var. *dissecta* Druce. 1. By the old railway on the top of Brendon. 2. "Frequent; always this, in cases which I looked at closely," *W.-D.* 3. West Monkton; very local.

Silaus flavescens Bernh. 2. Only a single plant seen, in Dunster marshes, *W.-D.* Apparently quite rare in S.W. Somerset, though frequent in the north and east.

Fœniculum vulgare Mill. 2. Plentiful in an old quarry, Alcombe, *W.-D.* Native on the coast, near Stolford.

Daucus gummifer All. 9. After an interval of more than thirty years I saw the plant which has been so named on Brean Down, last June. It comes very near Withering's figure of his *D. maritimus*, and only differs from good Sidmouth (S. Devon) *D. gummifer*, gathered a few days later, in its darker, more hairy, and slightly more acute foliage; both had markedly convex umbels, when in flower. I now think that the identification may stand, though it is not quite typical.

Caucalis nodosa Scop. 2. Grassy bank in the Park, Dunster.

Rubia peregrina L. 2. "Very common, everywhere I have been," *W.-D.* Coast, about Shurton and Lilstock; frequent. The records in Supplement, p. 90, for district 1 belong to 2.

Galium Mollugo L., var. *Bakeri* Syme. 5. In profusion on railway embankments between Somerton and Kingweston; in full flower, when the type was barely in bud.

Asperula odorata L. 2. Roadwater; valley, south of Timberscombe, *W.-D.* Lower Merridge.

Solidago Virgaurea L. 2. "Certainly common, all up the Roadwater valley; scattered elsewhere, but not common?" *W.-D.*

Erigeron acre L. 2. Quarry, Alcombe, *W.-D.* 8. North side of Creech Hill, Milton Clevedon; both in natural turf and in some grassfields.

[*Anaphalis margaritacea* R. Br. 2. Major Wolley-Dod found a large patch of this N. American species on the old railway at the top of Brendon, thoroughly established. My station near East Anstey is in district 1.]

Gnaphalium uliginosum L. 2. "Too general to specify stations; quite common, I should say," *W.-D.* Only "rather common" (as stated in Fl. Som.) in the county, as a whole, I believe.

Inula Helenium L. 2. On the edge of ponds and on the sides of hedgebanks at Stolford, *W. A. Withycombe*, sp. 4. Chard Reservoir, *Miss A. G. Miller.*

**Matricaria suaveolens* Buchenau (*M. discoidea* DC.). 2. Waste field, Roadwater, abundantly, *W.-D.* No doubt it will spread as rapidly here as elsewhere.

Tanacetum vulgare L. 1. By the Station, at the summit of

the old railway, Brendon Hills, *W.-D.* 2. Quarry, Alcombe; roadside, Roadwater valley, *W.-D.*

Artemisia maritima L. 2. Stolford; Lilstock.

Petasites hybridus Gaertn., Meyer & Schreb. (*P. ovatus* Hill). 1. By the Exe, below Exford, *W.-D.* 2. Rather frequent in the Roadwater valley; by the Avill brook, below Timberscombe, *W.-D.*

Senecio sylvaticus L. 1, 2. Top of Brendon; moor above Ellicombe, *W.-D.*—*S. erucifolius* L. 2. Roadwater valley, *W.-D.* Shurton.

Carduus crispus L. 2. Near Luxborough; Roadwater valley, *W.-D.*

Cnicus acaulis Willd. Common on the Lias, about Shurton and Lilstock.

Centaurea Cyanus L. 3. Field near Thurloxton, *W. D. Miller.* Unusually scarce in Somerset; hardly more, indeed, than a casual.

Cichorium Intybus L. 2. Roadwater valley; also *Picris hieracioides* L. Along the old railway, *W.-D.*—*P. echioides* L. 2. Shurton.

Hieracium "*Schmidtii* Tausch var. *eustomon* Linton." 2. A stylose form occurs with the normal one, on coast-rocks near Greenaleigh. I very strongly doubt its specific identity with *H. Schmidtii.* Mr. Linton did not think that a specimen sent to him was his *eustomon*, and suggested comparison with a plant from the Great Orme's Head, which has been referred to *H. britannicum.* I find, however, that neither this nor any form of *H. stenolepis* will fit the Minehead hawkweed, either in foliage or heads. It comes very near authentic *eustomon* in both respects, but is often (not always) a good deal more glandular on the phyllaries.—*H. sciaphilum* Uechtritz (*vulgatum* Syme, non Fries; *sylvaticum* Smith, non Gouan). 2. Roadside between Kersham and Timberscombe; wood near Luxborough; incline of the old railway to the Brendon Hills, *W.-D.*—*H. boreale* Fr. 2. Foot of the incline of the old railway to the Brendon Hills, *W.-D.*; also *H. umbellatum* L.

Leontodon nudicaule Banks & Sol. 2. Coast, east of Lilstock. No doubt we have the hairy-headed var. *lasiolænum* Druce, as well as the type; but I have only learned recently how to distinguish them. The former seems to be chiefly submaritime.

Lactuca muralis L. Lower Merridge, on (apparently) non-calcareous soil, which is exceptional.

Sonchus arvensis L. 2. A striking plant, with very prickly leaves and rounded auricles, much like those of *S. asper* Hill, grows on coast shingle at Shurton Bars. Mr. Arthur Bennett names it var. **spinulosus*, described in *Flora des nordwest-deutschen Tiefebenes*, p. 520 (1894).

Tragopogon minus Mill. 2. Old railway in the Roadwater valley; rather frequent about Minehead, *W.-D.*

Jasione montana L. 2. "Quite frequent in suitable localities," *W.-D.*

Wahlenbergia hederacea Reichb. "In most of the mossy valleys, everywhere," *W.-D.*

**Campanula Trachelium* L. 2. Old gravel-quarry above

Alcombe; wood by the railway at Lower Roadwater, *W.-D.* A very good and unexpected novelty for S. Somerset. He saw no *C. rotundifolia* L.

Andromeda Polifolia L. 9. A few small, short patches on Blackdown, *Mrs. E. P. Sandwith*; Mr. J. W. White gathered a sprig in bloom on November 4th, last year.

Lysimachia nemorum L. 2. Luxborough; Bratton, *W.-D.* Lower Merridge.

Anagallis fœmina Mill. (*cærulea* Schreb.). 3. Halse, *Miss Amy Smith.* Field at Durston, *W. D. Miller.*—*A. tenella* Murray. 2. "As easily found in any mossy, moist valley as *Wahlenbergia*; certainly not deserving of special stations," *W.-D.*

Centunculus minimus L. 2. Lane above Ranscombe, near Timberscombe, sp.; moor-road above Alcombe, *W.-D.* Previously known only from one station in each of our vice-counties.

Ligustrum vulgare L. 2. Frequent on the Lias of the coast, about Shurton and Lilstock.

Vinca minor L. 2. Roadside, just north of Timberscombe, but doubtless an escape here; Bratton, not far from a cottage, *W.-D.* For over 100 yards, on a roadside bank between Stogumber and Sampford Brett, in great quantity; but a garden colour-variation, with flowers of a deeper blue than the ordinary form. 3. High, bushy roadside bank (or rather cliff) on the outskirts of Milverton; almost certainly an escape, but the conditions are against any likelihood of its having been intentionally planted there.

Erythræa pulchella Fr. 2. East of Lilstock, sparingly.

Cynoglossum officinale L. 2. Rough, grassy bank above Perriton: slopes above Wootton Courtney, *W.-D.*

[**Symphytum peregrinum* Ledeb.? 2. "Hopcott; above Alcombe: an obvious outcast, in both places. Leaves narrowed below, decurrent, but much less strongly so than in *S. officinale.* Flowers blue; corolla-lobes more or less reflexed. Calyx divided three-quarters to the base, very strongly muricate," *W.-D.*]

Anchusa sempervirens L. 2. Alcombe; near Bratton; near Timberscombe, *W.-D.*

Myosotis cespitosa Schultz. 2. "Too common to specify localities," *W.-D.* Lilstock.—*M. scorpioides* L. (*palustris* Hill). "Rather common, I think. Avill brook; Roadwater valley," *W.-D.* Hawkridge Water, Lower Merridge.—*M. repens* G. & D. Don. 2. "I think common, or frequent, by elevated rills; certainly by the Avill brook, below Timberscombe," *W.-D*

Cuscuta Epithymum Murray. 2. "Fairly frequent on the whole Wootton Common range," *W.-D.*—*C. Trifolii* Bab.? 2. Locally abundant in a pasture on the Lias cliffs, between Lilstock and Stolford. Parasitic on *Lotus corniculatus* L. From the habit and the host-plant, I am practically sure that it was this species, which I believe to be truly native, though rare, on our coasts; but the date (June 25th) was too early to see it in flower. Quite away from cultivation, and certainly wild.

Linaria Elatine Mill. 2. Cultivated field above Alcombe, *W.-D.* 3. Sandy field near Milverton; persistent, *Misses B.* and

M. Falcon.—L. vulgaris Mill. 2. "With distorted flowers (many of the spurs trifurcate; but not 'var. *peloria*') by a bridge over the old railway, below Lower Roadwater," *W.-D.*

Antirrhinum majus L. 2. Old walls of Cleeve Abbey !, *W.-D.* Here it varies much in colour, the form with sulphur-yellow flowers being very conspicuous.

Mimulus Langsdorffii Donn (*M. guttatus* DC. ?). 2. "About Dunster Station, and between there and Blue Anchor; much commoner in the Avill than in the Roadwater valley. Quite frequent in many places in the Minehead district," *W.-D.*

Sibthorpia europæa L. 2. Roadside, Holford, *W.-D.*

Veronica Anagallis L. 2. Lilstock—the segregate *V. aquatica* Poiret, I think.

Euphrasia Rostkoviana Hayne. 1. By the old railway on the Brendon Hills, *W.-D.*, sp. A delicate and small-flowered plant, analogous to *E. curta* Wettst., forma *piccola* Townsend. I have a closely related form from Savernake Forest, above Marlborough, N. Wilts; but that had violet corollas, and a few simple hairs mixed with the long-stalked glands. Neither of them agrees with Mr. Druce's Exmoor specimens of *E. fennica* Kihlman (kindly lent to me for comparison); these are strong, 6–12 inches high, with very erect stems, simple, or with one or two slender, erect lower branches, giving them a most distinct appearance. 8. Fine and typical in moist, hilly pastures above Milton Clevedon.—*E. stricta* Host. 1. By the old railway, on the top of the Brendon Hills; associated with *E. gracilis* Fr. and *E. curta* Wettst., var. *glabrescens* Wettst., *W.-D.* Specimens of each sent to me.

Pedicularis sylvatica L. 2. "I should have thought too common to detail," *W.-D.* He did not observe *P. palustris*.

**Rhinanthus stenophyllus* Schur. 8. Abundant in a pasture (Upper Oolite) at the base of Creech Hill, over Lamyatt. Intercalary leaves numerous; internodes long, as is usual in our British plants. New for Somerset.

Melampyrum pratense L. 2. Major Wolley-Dod thinks this as common as what we call "type," where he has been.

Orobanche minor Sm. 2. On the old railway at Roadwater, *W.-D.*

Pinguicula lusitanica L. 6. Chard Common, *W. Watson* and *W. D. Miller*; unusually luxuriant; flower-stalks up to six inches high.

Verbena officinalis L. 2. A few plants ("in an old orchard ?"), a little south of Washford Station, *W.-D.*

[*Mentha longifolia* Huds. 2. On a waste-heap at the shore end of a lane, north-east of Dunster Station, *W.-D.*].—[*M. spicata* L. 2. Waste place above Alcombe, but an obvious outcast; Holford, not native, *W.-D.*]—*M. piperita* L. 2. By a cottage at Bratton; Holford, *W.-D.*

Calamintha montana Lam. (*C. officinalis* Moench). 2. Roadside between Washford and the Station; between Timberscombe and Cowbridge, *W.-D.*

Melissa officinalis L. 2. Road to the moor, above Alcombe, *W.-D.*

Salvia Verbenaca L. 5. Slopes on the Lias, near Kingweston.

Marrubium vulgare L. 2. A large patch (native) on the coast at Lilstock.

Stachys officinalis Trevisan. 2. "Specially struck me as 'rather uncommon.' Roadwater valley; Brendon Hills," *W.-D.* —*S. arvensis* L. 2. Croydon Hall, *W.-D.*

Plantago maritima L. 2. "Certainly too common to specify localities," *W.-D.* Stolford.—*P. Coronopus* L., var. **bipinnatifida* Wirtg. (*fide* Ar. Bennett). 9. Sandy roadside green, Berrow; apparently new for Somerset. A biennial plant, up to eight inches across, with very finely divided foliage; which, as well as the flower-stalks, is closely appressed to the soil.—Var. **pygmæa* Lange! 2. In poor, sandy ground near the entrance to Minehead Warren. 9. Stony places, not far from the Fort, at the north-west end of Brean Down. New record for both vice-counties.—Var. *Sabrinæ* Baker fil. & Cardew. 9. One strong plant, with six flowering stems, on maritime rocks near the Fort, Brean Down; leaves smaller and more hoary than on Steep Holm, but the difference is merely due to exposure. I can hardly believe that this woody-rooted perennial is really conspecific with *P. Coronopus*; and Mr. Druce, who (like myself) has grown it in his garden, is decidedly of the same opinion. I find that the crown of the leaf-rosettes usually has a clothing of dense, white, woolly hairs.—Two other strong plants from Brean Down, of this affinity, are not yet determined; one is biennial, hoary-hispid with rather distant linear leaf-segments of unequal length, and a narrow rachis: the other is perennial, with a dense "mat" of foliage, pilose to hispid, but hardly hoary; the segments being close, linear, acute, with some white wool at the crown of the rosette.

Chenopodium album L. 2. "I should have said that var. *paganum* Syme was quite as common [about Minehead] as var. *viride* Syme," *W.-D.*

Rumex pulcher L. 2. About Minehead, rarely, in newly made roads, &c.; also near the Warren, by the shore, *W.-D.* This confirms Collins's old record. 5. Slopes on the Lias above Hurcot, between Somerton and Kingweston.

Euphorbia amygdaloides L. 2. "Not 'very common' in the Minehead neighbourhood," *W.-D.* He noted *E. Paralias* L. from the coast, north-east of Dunster!

Salix alba L. 2. "Copse near Carhampton, but not (I think) at all common generally; above Alcombe," *W.-D.*—*S. caprea* L. 1. Common on the top of the Brendon Hills, *W.-D.* 2. Quarry, Alcombe; "pretty general, and rather common," *W.-D.*—*S. aurita* L. 1 and 2. Common on the top of the Brendon Hills; old railway, Roadwater valley; between Kingsbridge and Luxborough, *W.-D.*

Populus tremula L. 1. Railway, top of the Brendon Hills, *W.-D.* 2. Between Kingsbridge and Luxborough; perhaps planted, *W.-D.*

Orchis pyramidalis L. Very local on the Lias, between Stolford and Lilstock.—*O. latifolia* L. 2. Valley below Luxborough, *W.-D.*—*O. ericetorum* Linton. 2. "All I looked at

Retz., subspecies *œdocarpa* Andersson. 2. "Common enough on the moors," *W.-D.*

Milium effusum L. 2. Wood near Luxborough, *W.-D.*

Phleum pratense L., var. **præcox* (Jord.). Scarce on the dry coast west of Stolford; just like Kentish plants so named by Mr. Bennett.

Agrostis setacea Huds. 2. Common on Dunkery; seen also on the Brendon Hills, *W.-D.*

Calamagrostis epigeios Roth. 2. Coast below Shurton.

Aira præcox L. "Abundant on the moors," *W.-D.*

Arrhenatherum elatius Mert. & Koch, var. **bulbosum* Koch. 2. Sampford Brett. Doubtless often overlooked; I only noticed this through digging it up with the root of another plant.

Sieglingia decumbens Bernh. 2. Wootton Common; Dunkery; Brendon Hills, *W.-D.* Coast, east of Lilstock.

Molinia cœrulea Moench. 2. Dunkery, *W.-D.*

Catabrosa aquatica Beauv. 2. Lane below Ranscombe; near Bratton; above Perriton; stream above Minehead Post-office, *W.-D.*

Festuca Myuros L. 2. Roof at Alcombe; old Station, Roadwater, *W.-D.*—*F. elatior* L. 2. Railside near Roadwater, *W.-D.*

Nardus stricta L. 2. Wootton Common; Dunkery: "is, I feel sure, common on moors," *W.-D.* 6. Chard Common, *W. Watson.*

Phyllitis Scolopendrium Newman. 2. With bifurcated stripes, and much divided apex to fronds, Perriton Farm, *W.-D.*

Polystichum aculeatum Roth? "*P. lobatum* Presl., according to my idea of it, is the only one I have seen. About Timberscombe and in the Roadwater valley it is almost, if not quite, as common as *Lastrea Filix-mas*," *W.-D.*

HUMULUS AMERICANUS Nuttall.

By E. S. Salmon & H. Wormald.

In 1847 Nuttall, in his "Descriptions of Plants Collected by William Gambel, M.D., in the Rocky Mountains and Upper California" (Journ. Acad. Nat. Sci. Philadelphia, vol. i. sec. ser., p. 181 (1847)), described *Humulus americanus* with the following diagnosis: "Leaves three to five-lobed, the upper sometimes entire; inner divisions lanceolate-acuminate, denticulate along the apex; scales of the cone ovate, acute, the lower ones acuminate. *Hab.*—Throughout the United States in alluvial situations. I have also most luxuriant specimens from the borders of streams in the Rocky Mountains, near the line of New Mexico, collected by Dr. Gambel. I have ventured, as I think on sufficient grounds, to separate the American from the European hop. Found, as it is, in the uncultivated interior of the continent, beyond the reach of inhabitants, our plant must necessarily be indigenous. I have compared the present with the foreign plant with some attention, and I can in all cases readily distinguish them by the foliage. In the American plant, whatever be the other variations of the leaf, the *attenuated* points are denticulated

nearly to the extremity. In the European the summit of the leaf is abruptly toothed. In the native plant the male flowers appear to be smaller, and the scales of the cone are likewise acuminate. In some specimens, as in the European plant, the upper leaves are simply cordate and entire, but in all cases the denticulations are smaller and more numerous."

Subsequently, however, all botanists (so far as we know) have united this indigenous American hop with *H. Lupulus* Linn. of Europe (*cf.* A. Gray, Man. Bot. Northern United States, p. 464 (1890); Britton & Brown, Illust. Fl. Northern United States, &c., p. 530 (1896); and *Index Kewensis*).

In the opinion of the present writers *H. americanus* Nuttall is a distinct species. It can easily be separated from all forms of *H. Lupulus* by its foliage, as Nuttall pointed out; it has, moreover, other distinctive characters. The two species can be contrasted as follows:—

	H. americanus.	*H. Lupulus.*
Lobes of leaf . .	5–11, with tendency for terminal lobe to be 3-lobed	3–5 (very rarely 7), terminal lobe not divided
Apex of lobes . .	Acuminate	Obtuse
Terminal lobe . .	About $\frac{3}{4}$ the length of the lamina; breadth about $\frac{1}{2}$ length; base narrow, about $\frac{1}{2}$ width of the lobe	$\frac{2}{3}$ (or usually less) of lamina; breadth about equal to length; base broader, more than $\frac{1}{2}$ width of the lobe.
Furrow of petiole .	Shallow	Usually deep
Stipules . . .	Reflexed	Upright to spreading
Glands of anthers .	Usually 10–20	Less than 10 (rarely more than 10)
Disc of ♂ flower .	Eglandular	Usually glandular
Perianth of ♂ flower .	Usually conspicuously glandular	Glands usually 0, or very few and scattered

In *H. americanus* the lamina of the leaf is almost flat; in *H. Lupulus* the recurving of the margin and wrinkling of the leaf are usually well pronounced. In *H. americanus* the (lupulin) glands on the under side of the leaf are usually numerous, *i. e.* more than fifty to the $\frac{1}{4}$-in. circle, and are often very numerous, *i. e.* more than seventy-five to the $\frac{1}{4}$-in. circle; in *H. Lupulus* the glands are usually few, *i. e.* less than fifty to the $\frac{1}{4}$-in. circle, very rarely numerous; often very few, *i. e.* less than twenty-five to the $\frac{1}{4}$-in. circle. A difference is observable in the inflorescence of the male plant; in *H. americanus* the laterals are more "open" than those of *H. Lupulus*, *i. e.* the flowers appear to be less crowded together. On close examination the difference is found to be due to the greater rigidity of the flowering branches of *H. americanus*, so that they stand out from the axis (primary, secondary, &c.), bearing them more nearly at right angles than in *H. Lupulus*, where the branches are more or less drooping unless supported. In *H. americanus* the pedicel is usually sharply curved at right angles

immediately beneath the flower, and there is a tendency for the secondary laterals to bear the tertiary branches unilaterally.

Our observations have been based for the most part on the study of living specimens of the cultivated variety of the American hop known as the Oregon "Cluster," obtained in 1908 from Oregon and grown since at Wye, Kent; and as regards *H. Lupulus*, on the study of the numerous cultivated English and German varieties in the Experimental Hop-garden at the South-Eastern Agricultural College, Wye, Kent. Herbarium specimens have also been consulted. Nuttall's herbarium is now in the Department of Botany, British Museum, but does not contain *H. americanus*. Nuttall sent plants to Hooker from 1828 to 1858, and in Hooker's herbarium at Kew there is a specimen labelled "Nuttall from Gambell, California." This is a small portion of a female plant, and in its leaf-characters and the reflexed stipules agrees with the Oregon "Cluster" plants.

It is to be noted that botanists, *e. g.* Britton & Brown, *l. c.*, and Britton in his *Manual* (1901), while referring the American plant to *H. Lupulus*, describe the stipules as reflexed.

While there seems to be no doubt that *H. americanus* is truly indigenous to America, it appears that cultivated varieties of *H. Lupulus* imported from Europe (Germany and England) for cultivation by the hop-grower are commonly found growing "wild" in America. Asa Gray says, in the *American Druggist*, p. 111 (1886) (see Braungart, *Der Hoppen*, 147 (1901)), that in his opinion all so-called wild hops in North America came originally from the plants which have been brought from Europe, and that hops grow truly wild in America only on the banks of certain rivers of West Canada to New Mexico, probably also in Arizona. Britton & Brown, *l. c.*, remark of the American hop: "Extensively escaped from cultivation. Native also of Europe and Asia."

The plant described as *H. Lupulus* var. *neo-mexicanus* Nels. & Cockerell (Proc. Biol. Soc. Wash., 16 : 45 (1903)), which has deeper divided leaves, should apparently be placed under *H. americanus*. J. M. Coulter (New Man. Bot. Central Rocky Mountains, p. 144 (1909)) stated that this variety "is the common form in Colorado and New Mexico"; and P. A. Rydberg (Fl. Colorado, p. 100 (1906)) refers to it as "the native hop of the Rocky Mountain region," and states that it "has deeper divided leaves and more sharply acuminate bracts than the cultivated variety."

A further characteristic of *H. americanus* deserves notice, as it may possibly prove to be of specific importance—that is, its aroma. The aroma of the "Cluster" hop grown either in America or in this country is so distinctive, that a single "hop" (strobile) can be immediately detected among the "hops" of any cultivated (European) form of *H. Lupulus*. This distinctive aroma has been compared by one of us (E. S. Salmon, *Notes on Hops*, 1912–14, p. 29 (1914)) to the "black currant" aroma; Dr. J. Schmidt (Comptes-rendus Lab. Carlsberg, xi. 155 (1915)) says of it: "the aroma in question is, I should say, rather much like that of turpentine, with a touch of something faintly resembling the aromatic

scent associated with *Ruta graveolens*." It is much to be desired that the aroma of the wild *H. Lupulus* of Europe is compared with that of the indigenous American species *H. americanus*. For this purpose the writers will be glad to receive portions of living plants. That great care will be necessary in most European countries to ensure that the plant is the *wild H. Lupulus*, and not some "escaped" cultivated form, is apparent from the following. In 1913 we received from Prof. P. A. Saccardo portions of plants and also seeds, localised and annotated as follows: "Vittorio (Treviso), ad sepes omnino sponte. In Italia Humulus non colitur." This year, however, we learn from Dr. M. Corvi, of the R. Istituto Superiore Agrario of Perugia, that in 1860–70 the hop was cultivated near Bologna "with good results," and that now experiments with its culture are being carried on in Umbria.

It is clear, from what has been stated above, that for similar reasons care is required to separate the wild American species from "escaped" forms of the European species.

Successful attempts have been made (*see* E. S. Salmon in Journ. S.-E. Agric. Coll. vol. 21, p. 408 (1912)) to cross *H. americanus* with *H. Lupulus*; most of the hybrids so obtained are completely fertile and produce normal "hops" (strobiles); some of the hybrids, however, have produced "monstrous" inflorescences.

THREE NEW PERYMENIUMS.

By S. F. Blake, A.M.

Perymenium lineare. Frutex vel frutescens supra ramosus. Caulis tenuis purpurascens scaberrime strigilloso-verrucosus striatus vel subquadrangularis. Folia opposita linearia vel angustissime lineari-lanceolata acuminata basi acuta valde revoluta integra supra viridia impresso-rugulosa scaberrime tuberculato-strigillosa subtus pallidiora vix canescentia subdense patenti-pilosula glanduloso-adspersa venoso-reticulata 6–7·7 cm. longa 2·3–4·5 mm. lata. Petioli immarginati tuberculati 2–5 mm. longi. Capitula ad 2·8 cm. lata cymoso-paniculata (8–33) in apicibus ramorum in pedunculis dense tuberculato-strigillosis; pedicelli 8–34 mm. longi. Discus 6- (fructu) 10 mm. altus 6–7 mm. dimetente. Involucri 4-seriati sensim gradati 5·5 mm. alti campanulati squamæ ovatæ ad (interiores) ovales induratæ pallidæ minute densissime tuberculatæ non ciliolatæ apice appendice subabrupte herbacea obtusa triangulari vel rotundato-depressa prædítæ. Radii ca. 15 flavi anguste oblongi fertiles 12 mm. longi 1·8 mm. lati. Corollæ disci flavæ subglabræ 4·2 mm. longæ (tubulo 1 mm.). Paleæ flavescentes angustæ acutæ glabræ subcarinatæ 6 mm. longæ. Achenia (immaturissima) appresse pubescentia; aristæ pappi numerosæ caducæ sursum spinulosæ subæquales (duabus duplo longioribus exceptis).—Columbia: Prov. Magdalena, 1852–53, *Warscewicz* (Hb. Kew).

Perymenium Mathewsii. Frutex ramosus. Caulis subteretus striatulus ± strigillosus demum glabratus cortice cano-brunneo tectus; ramuli juniores pallide luteo-brunnei strigillosi ± glandulosi apice capitula 2–4 longepedunculata gerentes. Folia (ramulorum) opposita ovato-lanceolata acuminata basi truncato-rotundata serrata (dentibus ca. 14–18-jugis depressis) supra basin 3-nervia vix revoluta supra obscure viridia rugosa strigoso-scabra subtus pallidiora venulosa ubique hispidula 4–6·5 cm. longa 1·5–2·6 cm. lata. Petioli superne anguste marginati hispido-pilosi 3–7 mm. longi. Capitula 4 cm. lata in pedunculis monocephalis strigillosis 3·5–8·5 cm. longis insidentia. Discus 8–9 mm. altus 11–14 mm. dimetente. Involucri 3-sub 4-seriati 6·5 mm. alti squamæ gradatæ extimæ brevissimæ interiores gradatim longiores ovales ad oblongæ strigillosæ ciliolatæ basi subcoriaceo-induratæ supra subherbaceæ apice late rotundatæ. Radii ca. 10 flavi oblongi fertiles 1·5 cm. longi 6 mm. lati. Corollæ disci flavæ in dentibus glanduloso-puberulæ 4·5 mm. longæ (tubulo 1·6 mm.). Paleæ firmæ scariosæ acutæ apice sparse hipidulæ 5–6 mm. longæ. Achenia radii trigona transverse rugulosa sparse (ad apicem dense) strigillosa angulis subalatis in dentes paleaceos ciliatos ad 0·6 mm. longos desinentibus; pappus verosim. ut in acheniis disci. Achenia disci compressa brunneo-nigra transverse rugulosa superne ala auriculiforme ciliata angulas duas achenii terminante 3·5 mm. longa 2·2 mm. lata; pappi aristæ ca. 15 subæquales ad 1·3 mm. longæ caducæ.—Peru: Purruchuca, *Mathews* 765 (Hb. Brit. Mus., Hb. Kew).

The plant from Mathews on which the present species is based was long ago mentioned by Bentham (B. & H. Gen. Pl. ii. 377 (1873)) as a new species of *Perymenium*. In Robinson & Greenman's revision of the genus (Proc. Am. Acad. xxxiv. 529 (1899)) it was, however, referred to *Viguiera*, evidently through some confusion of numbers or specimens, for the characters ascribed to it (alternate leaves and sterile ray flowers) are quite at variance with the true character of *Mathews* 765. This species and the next are of interest as the first members of the genus to be recorded from Peru; the only other species described from South America are *P. lineare* (see above) and *P. Klattii* Rob. & Greenm., both from Columbia.

Perymenium serratum. Verosim. frutex. Caulis dense appresse strigoso-pilosus apice leviter ramosus. Folia opposita ovato-lanceolata acuminata apice subacuta basi rotundata regulariter serrata (dentibus ca. 36–38-jugis depresso-triangularibus mucronulatis) subtrinervia supra obscure viridia subaspere strigillosa subtus canescenter tomentulo-pilosula 9·3–13 cm. longa 2·5–3·8 cm. lata. Petioli immarginati strigoso-pilosi 6–15 mm. longi. Pedunculi terminales et subterminales axillares capitula 3–6 (2·8 cm. lata) gerentes. Pedicelli ad 1·3 cm. longi. Discus 7 mm. altus 1·2 cm. crassus. Involucri 3-seriati subgradati 9–10 mm. alti squamæ oblongo-ovales apice rotundatæ interdum mucronulatæ basi subinduratæ substriatæ supra herbaceæ ciliolatæ dorso sparse strigillosæ. Radii ca. 8 fertiles flavi oblongi

bidentati 1 cm. longi 3·5 mm. lati. Corollæ disci flavæ in dentibus puberulæ 4 mm. longæ (tubulo 0·9 mm.). Paleæ scariosæ acutæ subcarinatæ ad apicem spinulosæ 5 mm. longæ. Achenia (immaturissima) compressa sub–4-angulata ± hispidula 0·8 mm. longa; aristæ pappi ca. 16 caducæ tenuissimæ strigillosæ valde inæquales (una vel duabus multo longioribus).—Peru: District Amazonas, Chachapoyas, *Mathews* (Hb. Brit. Mus., Hb. Kew).

AN OVERLOOKED CINCHONA.

By James Britten, F.L.S.

In revising our *Biographical Index* for the proposed new edition, we endeavoured to obtain more information about Richard Kentish, one of the many folk entered of whom very little is known. We knew him only as the author of a paper entitled "Experiments and Observations on a new species of Bark," which is further described on its title-page as "an attempt towards a general analysis and compendious history of the genus of Cinchona" (London, 1784, 8vo, pp. 123); and in the hope that this might furnish further information about him, I consulted the work in the British Museum. In this hope I was disappointed; beyond the fact that Kentish was then living at Huntingdon, that he was a member of the Royal Medical Society at Edinburgh and a corresponding member of the Society of Scottish Antiquaries, and that he was evidently a competent botanist, nothing further was elicited. But the full description which he gave of his "new species" appears to necessitate a change of nomenclature; in any case, it seems worth while to call attention to a name the origin of which has been overlooked and the authority for which has, so far as I know, never been correctly cited.

The plant is named by Kentish *Cinchona Sanctæ Luciæ*, from its place of growth, and is referred to by that name throughout his treatise: he gives a Latin description, and states that Mr. Davidson, a surgeon in Santa Lucia, had prepared a paper on the plant for publication in the *Philosophical Transactions*, from which, by Davidson's permission, the English description was transcribed. Incidentally, Kentish mentions that he had submitted the plant to Hope, of whom he had been a pupil. The description is as follows:—"Cinchona Sanctæ Luciæ. Floribus cymosis calyx quinquefidus. Corolla monopetala infundibuliformis, laciniis linearibus. Pistillum capitatum. Antheræ lineares. Semina multa, alata. Capsula biloculari ovali striata. Folia oblonga, disticha. Habitat inter nemora, locis umbrosis, præcipue ripa alicujus rivi" (p. 52).

Davidson's paper, with specimens, was communicated to the Royal Society by "Donald Monro, M.D., Physician to the Army, F.R.S.," and read on June 24th, 1784. It is prefaced by a note by George Wilson, "an ingenious apothecary in Henrietta Street, Covent Garden," who had examined the specimens and identified

them with "much finer ones" in the possession of Sir Joseph Banks. Banks gave him the brief diagnosis appended to Monro's introduction, which is a transcript of one by Solander in the Solander MSS. The plant is not named, nor does any name appear in Davidson's account of the species which follows Wilson's introduction and was published, with a plate, in Phil. Trans. lxxiv. 452–6 (1784). Davidson speaks of the plant as having been first found by Alexander Anderson, who brought it to Dr. Young of the General Hospital of Santa Lucia.

There are no specimens from Wilson in the Banksian Herbarium, nor do I find those from Young, which according to Solander's MS. should exist there: the plant is represented by specimens from Dominica by De Ponthieu, from which it would seem from the MS. that the original description was taken: when this was written the specific name "fragrans" was added, but for this *floribunda* was substituted by Dryander, and that name, which was given by Swartz (Prodr. 41, 1784), has been subsequently accepted for the species. Whether Swartz's plant is that to which the name has been generally applied is a matter that will doubtless be decided by Messrs. Fawcett and Rendle when they come to the *Rubiaceæ* in their *Flora of Jamaica*: at present it may be noted that the specimen in Herb. Banks which Swartz himself named *floribunda* has been referred to *Exostemma triflora* G. Don (*C. triflora* Wright).

According to Vitmann (Summ. Suppl. i. 264) as quoted by Roemer & Schultes (Syst. v. 19) the plant was named *C. Luciana* in Herb. Banks. I have not been able to consult Vitman's Supplement, which does not seem to be in any of the London libraries, but no such name is now to be found in Herb. Banks nor in the Solander MSS. The descriptive phrase which Wilson received from Banks is variously attributed to "David" (Roem. & Sch.) or "Davids" (Ind. Kew.), but although, as has been shown, Davidson gives a full description of the plant, he nowhere names it, nor does the name appear anywhere in the paper in Phil. Trans. which is usually referred to as containing it.

It seems to me, therefore, that Kentish's name *Sanctæ Luciæ* must be restored, and that the synonymy of the plant is as follows:—

EXOSTEMMA SANCTÆ-LUCIÆ comb. nov.

Cinchona Sanctæ Luciæ Kentish, New Species of Bark, p. 52 (1784).
C. floribunda Sw. Prodr. 41 (1788)?
Exostemma floribundum Roem. & Sch. Syst. v. 19 (1819), et auct. pl.
C. St.-Luciæ "David Philos. Transact. i. 74" (R. & S. *l. c.*, sed falsó).
C. Luciana "Herb. Banks. ap. Vitm. Summ. Suppl. i. p. 264" (1802). (R. & S. *l. c.*)

SUPPLEMENTARY RECORDS OF BRITISH RUBI.

(January, 1909—March, 1915.)

By the Rev. W. Moyle Rogers, F.L.S.

The following records have accumulated since the publication of a similar paper by me in this Journal for 1909, pp. 310–318, 340–346.

As was the case in that paper, Irish records are not included; but they have been much less numerous than in the earlier period.

Here, as before, where the record depends altogether on my personal authority the sign ! will be found after the name of the vice-county. In other cases the same sign following the name of the recorder implies that I have seen dried specimens, and am answerable for the correctness of the name. In the very few instances where no such sign appears (either after vice-county or recorder), it should be understood that, though I have not seen specimens, I think the record may be accepted as accurate. Records enclosed in rectangular brackets are based on specimens that I have seen and think probably rightly named, but with regard to which, for fully reliable determination, further specimens are desirable.

In nomenclature and sequence of species, the *London Catalogue of British Plants*, ed. x., is generally followed; while in the few instances where there is any departure from that, references in explanation will be found attached.

It should perhaps be pointed out that twelve of the records are dependent on specimens which I saw in 1911 in the Babington Rubus Herbarium at Cambridge University. Nine of these date as far back as 1845–1850, the remaining three being *bracteatus*, 1866, *Drejeri*, 1885, and *anglicanus*, 1880. That all twelve may be accepted as records for the vice-counties concerned I fully believe; but confirmatory specimens of recent date would be of considerable interest. And the same remark applies to other records due to Prof. Babington and accepted by me on the strength of specimens seen from time to time.

The abbreviation conf. = Confirmation of previous doubtful record.

Rubus idæus Linn. var. obtusifolius (Willd.).

13. Sussex W. F. A. Rogers!
64. York M.W. Bradley!

R. fissus Lindl.

17. Surrey!
71. Man. Wheldon!
106. Ross E. Marshall!
107. Sutherland E. Marshall & Shoolbred.

R. suberectus Anders.

32. Northants. Cumming!
106. Ross E. Marshall & Shoolbred.

R. Rogersii Linton.

17. Surrey. Marshall! Gilbert!
[32. Northants. Druce!]
64. York M.W. Bradley!
83. Edinburgh. "W. W. Elvam"!

R. SULCATUS Vest.

7. Wilts N. Ley!
11. Hants S. C. C. Babington hb.!

R. PLICATUS Wh. & N. var. BERTRAMII G. Braun.

3. Devon S. F. A. Rogers!

Var. HEMISTEMON (Genev.?).

3. Devon S.! Briggs (Brit. Mus.)!
34. Glost. W. E. M. Day!

R. OPACUS Focke.

42. Brecon. E. M. Day!

R. AFFINIS Wh. & N.

13. Sussex W.!
19. Essex N. G. C. Brown!

Var. BRIGGSIANUS Rogers.

6. Somerset N. Ley!
40. Salop. Edwin Lees (C. C. Babington hb.)!

R. CARIENSIS Genev.

3. Devon S.!

[R. CASTRENSIS Wolley-Dod.

41. Glamorgan. Trow!]

R. INCURVATUS Bab.

3. Devon S.! (conf.)
6. Somerset N. Day!

R. LINDLEIANUS Lees.

19. Essex N. G. C. Brown!
33. Glos. E. H. H. Knight!

R. RHAMNIFOLIUS Wh. & N.

59. Lanc. S. Wheldon!
60. Lanc. W. Alb. Wilson!

Var. BAKERI (F. A. Lees).

13. Sussex W.!
34. Glos. W. Day!
49. Carnarv. C. C. Babington!
67. Northants S. J. G. Baker! C. C. Babington!
70. Cumberl. C. C. Babington! H. Britten!

R. NEMORALIS P. J. Muell.

4. Devon N. Hiern!

Var. GLABRATUS Bab.

33. Glos. E. H. H. Knight!

Var. SILURUM Ley.

40. Salop! Ley!
71. Man. Wheldon!

R. SCHEUTZII Lindeb.

13. Sussex W.! F. A. Rogers!
[34. Glos. W. Ley!]
59. Lanc. S. G. H. Hopley!
71. Man. C. C. Babington! J. W. Hartley & Wheldon!
72. Dumfries. C. C. Babington!

R. DUMNONIENSIS Bab.

45. Pembroke. C. C. Babington!

R. PULCHERRIMUS Neum.

33. Glos. E. H. H. Knight!
59. Lanc. S. Travis!

R. MERCICUS Bagnall.

3. Devon S. F. A. Rogers!

Var. BRACTEATUS Bagnall.

3. Devon S. Briggs (hb. C. C. Babington)!
[74. Wigton. Druce!]

Var. CHRYSOXYLON Rogers.

[4. Devon N. Hiern!]

R. SELMERI Lindeb.

28. Norfolk W. W. Matthews (hb. C. C. Babington)! G. C. Brown!

R. RHOMBIFOLIUS Weihe.

3. Devon S.! M. A. Rogers!

4. Devon N.!
19. Essex N. G. C. Brown!
[41. Glamorgan. Trow!]

R. GRATUS Focke.

25. Suffolk E. Rolfe!
59. Lanc. S. Wheldon! G. H. Hopley!
[Var. SCIAPHILUS Lange?
32. Northants. Ley!]

R. THYRSOIDEUS Wimm.

11. Hants S.!

R. GODRONI Lecoq. & Lamotte.

33. Glos. E. Riddelsdell!

Var. FOLIOLATUS Rogers & Ley.

4. Devon N. Hiern!

Var. ROBUSTUS (P. J. Muell.)

4. Devon N.!
13. Sussex W.!
33. Glos. E. M. A. Rogers!
[40. Salop. Ley!]

Var. CLIVICOLA Ley.

33. Glos. E. Ley; Riddelsdell!

R. RUSTICANUS Merc.

59. Lanc. S. Wheldon.

R. PUBESCENS Weihe.

32. Northants. Druce!

Var. SUBINERMIS Rogers.

[3. Devon S. M. A. Rogers!]
4. Devon N. Hiern!
[19. Essex N. G. C. Brown!]
[33. Glos. E. M. A. Rogers.]

R. SILVATICUS Wh. & N.

7. Wilts N. Ley!
13. Sussex W.!
32. Northants. Cumming!
[41. Glamorgan. Trow!]
55. Rutland. Ley!

R. HESPERIUS Rogers, J. Bot. 1914, 181.

[14. Sussex E. Roffey!]
34. Glos. W. Ley! Day!

R. LENTIGINOSUS Lees.

4. Devon N.!
34. Glos. W. Shoolbred! Day!

R. MACROPHYLLUS Wh. & N.

32. Northants. Druce! Cumming!

R. SCHLECHTENDALII Weihe.

7. Wilts N. Ley!
33. Glos. E.! H. H. Knight!
34. Glos. W. Day!

Var. MACROPHYLLOIDES Genev.

29. Cambs. C. E. Moss!
30. Beds. C. E. Moss!
54. Lincoln N. Ley!

Var. AMPLIFICATUS (Lees).

3. Devon S. F. A. Rogers! M. A. Rogers!
13. Sussex W.!
34. Glos. W. Shoolbred! Ley!
36. Heref. Ley!

R. QUESTIERII Lefvr. & Muell.

4. Devon N. Hiern!

R. SPRENGELII Weihe.

83. Edinburgh. Cowan!

R. HYPOLEUCUS Lefvr. & Muell.

33. Glos. E. Riddelsdell!

R. HIRTIFOLIUS Muell. & Wirtg.

[4. Devon N. Hiern!]
17. Surrey. Beeby!
53. Linc. S. H. Fisher!
69. Westmorel. F. J. A. Hort, 1849 (hb. C. C. Babington)!

Var. ORBIFOLIUS (Boulay) (*R. danicus* Focke olim). See J. Bot. 1914, 204.

39. Staffs. Painter!
83. Edinburgh. Cowan!
84. Linlithgow. C. C. Babington!
85. Fife and Kinross. Cowan!
105. Ross W. Marshall & Shoolbred!
106. Ross E. Marshall & Shoolbred!

Var. MOLLISSIMUS Rogers.

3. Devon S.!
33. Glos. E. Riddelsdell!
34. Glos. W. Riddelsdell!

R. IRICUS Rogers.

3. Devon S.!
4. Devon N.! Hiern!
34. Glos. W. Ley!
36. Heref. Ley!
40. Salop. Ley!

R. PYRAMIDALIS Kalt.

19. Essex N. G. C. Brown!
33. Glos. E. Riddelsdell!

R. MACROTHYRSUS J. Lange.

32. Northants. Druce!

R. LEUCANTHEMUS P. J. Muell.?

13. Sussex W.!
30. Beds. E. M. Langley!
34. Glos. W. Riddelsdell!

R. LASIOCLADOS Focke.

34. Glos. W.!
35. Monmouth. Ley!

Var. LONGUS Rogers & Ley.

3. Devon S. Savery!
14. Sussex E. Roffey!
35. Monmouth. Ley!

R. CRINIGER Linton.

11. Hants S. Standen!
[19. Essex N. G. C. Brown!]

R. BORÆANUS Genev.

13. Sussex W. J. W. White!
[20. Herts. Druce!]

R. CINEROSUS Rogers.

34. Glos. W. Ley!
67. Northumb. F. A. Rogers!

R. MUCRONATUS Blox.

41. Glamorgan. Riddelsdell!

R. GELERTII Frider.

11. Hants S. Druce!
34. Glos. W. Ley!

R. ANGLOSAXONICUS Gelert var. CURVIDENS Ley.

3. Devon S.!
4. Devon N.! Hiern!
33. Glos. E. Riddelsdell!
34. Glos. W. Day!

Var. VESTITIFORMIS Rogers.

33. Glos. E.!
[40. Salop. Day!]

Var. RADULOIDES Rogers.

4. Devon N. Hiern! f. *umbrosa*.
33. Glos. E. Riddelsdell! M. A. Rogers!

Var. SETULOSUS Rogers.

3. Devon S. Hiern!
4. Devon N. Record still wanting.

R. FURVICOLOR Focke (*R. melanoxylon* Focke olim, non Muell. & Wirtg.). See J. Bot. 1914, 206.

43. Radnor. Ley!

R. INFESTUS Weihe.

89. Perth E. Cowan!

R. UNCINATUS P. J. Muell.

4. Devon N.!
13. Sussex W.!

R. Borreri Bell Salt.

49. Carnarvon. Day!

R. Drejeri G. Jensen.

19. Essex N. G. C. Brown!
34. Glos. W. J. W. White! Roper!
37. Worcester. Towndrow!
89. Perth E. Sturrock (hb. C. C. Babington)!

R. radula Weihe.

19. Essex N. G. C. Brown!
33. Glos. E. Riddelsdell!

Var. anglicanus Rogers.

62. York N.E. G. Webster (hb. C. C. Babington)!

Var. echinatoides Rogers.

34. Glos. W. Day!
71. Man. Wheldon!
83. Edinburgh. Cowan!

R. echinatus Lindl.

19. Essex N. G. C. Brown!

R. rudis Wh. & N.

14. Sussex E. Linton!
33. Glos. E.! F. A. Rogers!
53. Lincoln S. H. Fisher!

R. oigocladus Rogers (non Muell. & Lefv.). See J. Bot. 1914, 206.

19. Essex N. G. C. Brown!

Var. Newbouldii Rogers.

3. Devon S.! Hiern! M. A. Rogers!
4. Devon N.!
34. Glos. W. Ley!

Var. Bloxamianus (Colem.).

32. Northants. Ley!
65. York N.W. Day!

R. podophyllus P. J. Muell.

34. Glos. W. Ley! Day!

R. Griffithianus Rogers.

10. Wight. Bell Salter (hb. C. C. Babington)!
22. Berks. Druce!
23. Oxford. Druce!
26. Suffolk W. Hind (hb. C. C. Babington)!
40. Salop! Ley!

R. melanodermis Focke.

3. Devon S. Savery (conf.)!

R. Babingtonii Bell Salt.

3. Devon S.! f. *umbrosa*.
[4. Devon N. Hiern!]
[40. Salop. Ley!]

R. mutabilis Genev.

4. Devon N. Hiern!
34. Glos. W. Day!

R. fuscus Wh. & N. var. nutans Rogers.

4. Devon N. Hiern!

Var. macrostachys (P. J. Muell.)

32. Northants. Ley!
33. Glos. E. Riddelsdell!
34. Glos. W. Ley! Day! Riddelsdell!

Var. obscurus (Kalt.).

16. Kent W. Britton!
34. Glos. W. Ley! Day!

R. pallidus Wh. & N.

32. Northants. Ley!

Var. leptopetalus Rogers.

14. Sussex E. Hilton!

R. scaber Wh. & N.

13. Sussex W.! (conf.).
37. Worc. E. Lees (hb. C. C. Babington)!

R. thyrsiger Bab.

40. Salop! Ley!

R. BOTRYEROS Focke.
33. Glos. E. Riddelsdell!

R. FOLIOSUS Wh. & N.
20. Herts. E. M. Langley! (conf.)!

R. ROSACEUS Wh. & N.
19. Essex N. G. C. Brown!
30. Beds. E. M. Langley!
40. Salop. Leighton (hb. C. C. Babington)!

Var. INFECUNDUS Rogers.
33. Glos. E. Riddelsdell!
60. Lanc. W. Wheldon!

Var. POWELLII Rogers.
21. Middlesex. Roffey!

R. GLAREOSUS Rogers & Marshall.
16. Kent W. Britton!

R. HOSTILIS Muell. & Wirtg.
5. Somers. S. Marshall (small f.)!
[19. Essex N. G. C. Brown!]
34. Glos. W. Day (small f.)!
49. Carnarvon. C. C. Babington!
58. Cheshire. Marshall (small f.)!

R. HORRIDICAULIS P. J. Muell.
3. Devon S. Savery!
4. Devon N. Hiern!
[5. Somers. S. Fry!]
14. Sussex E. Roffey!

R. DASYPHYLLUS Rogers.
71. Man. Wheldon!

R. PLINTHOSTYLUS Genev.
3. Devon S. Hiern!

R. MARSHALLI Focke & Rogers.
[4. Devon N. Hiern!]
20. Herts. E. M. Langley!
33. Glos. E. Day! f. *aprica*.

Var. SEMIGLABER Rogers.
3. Devon S. Briggs!
4. Devon N. Hiern!
13. Sussex W.!
19. Essex N. G. C. Brown!

R. VIRIDIS Kalt.
32. Northants. Ley!
53. Lincoln S. Fisher!

R. DUROTRIGUM R. P. Murray.
13. Sussex W.! F. A. Rogers!

R. SERPENS Weihe.
12. Hants N. Record still wanting.
38. Warwick. Cumming!

R. HIRTUS Waldst. & Kit. var. ROTUNDIFOLIUS Bab.
13. Sussex W.!

Var. KALTENBACHII (Metsch.).
13. Sussex W. M. A. Rogers.
17. Surrey. Roffey!

Var. FLACCIDIFOLIUS (P. J. Muell.).
13. Sussex W.!
32. Northants. Cumming!
33. Glos. E. Day!

Var. RUBIGINOSUS (P. J. Muell.).
13. Sussex W. F. A. Rogers!

Var. MINUTIFLORUS (P. J. Muell.).
12. Hants N. Eyre!

R. OCHRODERMIS Ley.
3. Devon S.
4. Devon N.
5. Somers. S.
Records still wanting for these vice-counties.

R. DUMETORUM Wh.& N.

a. FEROX Weihe.

40. Salop!

b. BRITANNICUS Rogers.

20. Herts. E. M. Langley!
33. Glos. E.! M. A. Rogers!
40. Salop! weak form.

c. DIVERSIFOLIUS (Lindl.).

33. Glos. E. Riddelsdell! M. A. Rogers!

h. RADULIFORMIS Ley.

[3. Devon S.!]
12. Hants N. Eyre!
[14. Sussex E. Standen!]
16. Kent W.!
17. Surrey. Britton!
33. Glos. E. M. A. Rogers!
34. Glos. W. Riddelsdell!
40. Salop. Ley!

i. CONCINNUS Warren.

38. Warwick. Bagnall!
59. Lanc. S. Wheldon! Travis!
60. Lanc. W. Record still wanting.

R. CORYLIFOLIUS Sm.

a. SUBLUSTRIS Lees.

59. Lanc. S. Wheldon!

b. CONJUNGENS Bab. (*cyclophyllus* Lindeb. See J. Bot. 1914, 208.)

82. Haddington. Cowan!

R. CÆSIUS Linn.

82. Haddington. Cowan!
83. Edinb. Cowan!

NOTE.—I owe an apology to the Editor and readers of this Journal when referring, as above, to my article in the volume for 1914 (pp. 178, &c.) entitled "Notes on Dr. Focke's *Rubi Europæi* (1914)." The above title would lead one to expect a distinct and separate work, but is intended to refer to the third part of Dr. Focke's *Species Ruborum*, published in the *Bibliotheca Botanica*, Stuttgart, 1914. My error in referring to it in so misleading a way was due to the fact that the copy sent to me by the author has no prominent title on the paper cover except "*Rubi Europæi*. Autore W. O. Focke," though this is followed even there by the words (in much smaller type and bracketted) "*Bibliotheca Botanica*. Heft. 83," as well as by fuller descriptive titles within.

FURTHER NOTES ON ARCTIUM.

BY A. H. EVANS, M.A.

IN the following paragraphs I hope to add a little to our knowledge of the above-mentioned genus, which I discussed fully in this Journal for 1913, pp. 113–119:—

Through the kindness of Professor Massart and Dr. Moss, I have been able to examine Lejeune's original specimen of *Arctium nemorosum*. I find that it is undoubtedly referable to *A. vulgare* (Hill) Evans, and probably to its subvariety *pycnocephalum*, though the specimen is too poor for absolute certainty. The synonymy I gave must therefore be amended by the transference of the synonym *A. nemorosum* Lejeune from *A. minus* to *A. vulgare*.

With regard to Hill's figures, I have re-examined them in the

light of some remarks made by Swiss botanists and by Mr. Druce (Report Bot. Exch. Club, 1913, p. 475). The figure which I referred to *A. vulgare* belongs, I am fully convinced, to that species, and Dr. Moss agrees that there can be no doubt whatever on this point. Hence the specific name *vulgare* must stand, as it is the earliest which has been applied by any authority to the plant in question. It is quite possible that the figure I referred to *A. Lappa* should really be assigned to *A. vulgare* also, and that Hill did not figure *A. Lappa* at all. Here Dr. Moss is again in agreement with me.

The general result of my re-examination and survey of all the evidence is therefore that, while I have modified my opinions regarding *A. nemorosum* Lejeune and *L. Arctium* Hill, there is no further change to be made in nomenclature, and the names in my previous article hold good.

I append the results of my observations upon the distribution of the British forms. Though it is not yet possible to come to any final conclusions on this matter, it seems to be strongly indicated (1) that *A. vulgare* in its two forms is the common British plant (as Hill stated), occurring northwards to Shetland; (2) that *A. Lappa* (= *A. majus*) is a southern plant, no definite record having as yet been passed by me north of S. E. York; (3) that *A. minus* is locally common in southern England and rare in the northern parts, though it occurs as far to the northward as Haddington, in Scotland. *A. Lappa*, moreover, has a predilection for chalk or limestone, while *A. vulgare* seems to avoid the lightest soils. The former may have been accidentally introduced in some of the vice-counties given below.

Finally, this article is mainly written in the hope that botanists will send to the author (9, Harvey Road, Cambridge) fresh unpressed specimens from the vice-counties not indicated, in order that later lists may be much more full and perfect. One fair-sized shoot of a kind is sufficient, packed in any ordinary small tin.

A. LAPPA L. S. Devon; N. Somerset; N. Wilts; Dorset; S. Hants; W. Sussex; W. Kent; Surrey; S. Essex; N. Essex; Herts; Middlesex; Berks; Oxford; Bucks; Suffolk; Cambridge; Hunts; Northampton; W. Gloucester; Monmouth; Hereford; Warwick; Glamorgan; Caermarthen; Lincoln; Leicester; S. E. York; S. W. York; Mid-West York; Ireland (Cork).

A. VULGARE Evans. W. Cornwall; E. Cornwall; S. Devon; N. Somerset; S. Hants; W. Sussex; E. Kent; Surrey; N. Essex; Oxford; E. Suffolk; W. Suffolk; Cambridge; Hunts; W. Gloucester; Monmouth; Hereford; Warwick; Salop; Glamorgan; Anglesea; N. E. York; S. W. York; Mid-West York; Kirkcudbright; Wigton; Haddington; Fife (I. of May); Westerness; Dunbarton; Clyde Isles (Bute); W. Ross; E. Ross; Ireland (Bray, Killarney, Rathlin Island).

A. VULGARE subvar. PYCNOCEPHALUM Evans. E. Cornwall; Isle of Wight; W. Sussex; E. Kent; W. Kent; Surrey; Herts;

Middlesex; Oxford; Bucks; Cambridge; Bedford; Northampton; Warwick; Glamorgan; Caermarthen; Carnarvon; S. Lincoln; N. Lincoln; Leicester; Derby; W. Lancaster; N. E. York; S. E. York; S. W. York; Cheviotland; Dumfries; Wigton; Selkirk; Roxburgh; Berwickshire; Haddington; Edinburgh; Fife; Stirling; E. Perth; Forfar; S. Aberdeen; Easterness; Clyde Isles (Bute); E. Ross; E. Sutherland; Caithness; Orkneys; Shetlands; Ireland (counties Londonderry, Antrim, Mayo—Clare Island, Cork).

A. MINUS Bernh. E. Cornwall; S. Devon; N. Somerset; S. Hants; N. Hants; W. Sussex; E. Sussex; E. Kent; W. Kent; Surrey; S. Essex; N. Essex; Herts; Middlesex; Berks; Oxford; Bucks; W. Suffolk; W. Norfolk; Cambridge; Bedford; Hunts; Northampton; W. Gloucester; Monmouth; Hereford; Warwick; Salop; Glamorgan; Brecon; Radnor; Caermarthen; Cardigan; Montgomery; Denbigh; Anglesea; S. Lincoln; N. Lincoln; Derby; Chester; N. Lancaster; S. W. Yorks; Cheviotland; Berwick; Haddington.

SHORT NOTES.

HELLEBORUS VIRIDIS (p. 113).—I was very interested in Miss Roper's note on the purple-blotched form of this plant. We have the same thing in Surrey, specimens having been sent me this year from a wood near Chelsham, where Mr. A. Beadell, the finder, tells me it grows with the ordinary green-flowered plant. In three other stations for *H. viridis* in the county I have only seen the normal form. Rouy & Foucaud (Fl. Fr. i. 116, 1893) say, of *H. viridis* agg., "sépales verdâtres ou rougeâtres" but, like Miss Roper, I have failed to find any mention of the purple-spotted state.—C. E. SALMON.

[Mr. H. S. Thompson has sent to the Department of Botany excellent fresh specimens of the plant from Winterhead farm, Sidcot, Somerset, the station referred to by Miss Roper. Many of the flowers are of the normal pure green, but the sepals of others are blotched with purple in various degrees, and some have the purple margin frequent in *H. fœtidus*: there is however nothing in the specimens to suggest hybridity with that species. The very numerous specimens in the British Herbarium do not show the blotches, but in one from Gloucestershire the purple margin is very conspicuous.—ED. JOURN. BOT.]

JUNCUS BALTICUS Willd. (p. 91).—I had noticed that the W. Lancs. plants differed from my Scottish specimens (smaller, greener; panicle closer, fewer-flowered, &c.). On receiving a sheet, Mr. Arthur Bennett wrote:—"This seems to be var. *pseudoinundatus* Asch. & Graebn., *Flora des Nordostdeutschen Flachlandes*, p. 173 (1898). This occurs on the dunes of the Dutch islands of Vlieland, Tuschell, Ameland and Borkham, associated with the same species as at Ansdell. It is strange it is so rare on the mainland Dutch dunes; only found in 1859 by

Lacoste." In their *Synopsis*, ii. 2, 438 (1904), Ascherson & Graebner say:—"Rhizomes more shortly creeping. Stems very slender. Rare . . . May easily be confounded with J. balticus × filiformis." Apparently this variety is new for Britain; Southport (v.-c. 59, S. Lancs.) specimens collected by Messrs. Adamson and Wheldon are, I think, the type, and much stronger. —Edward S. Marshall.

Arum maculatum L.—May I direct attention to an interesting form of this plant seen in Surrey last year? Normally, the spadix is of a dull purplish hue, but in the form referred to this is of a clear yellow colour. In this my plant agrees with the var. *Tetrelii* Corb., described by Rouy (Fl. de France, xiii. p. 278)—"Spadice et étamines jaunes (et non rouges); feuilles maculées de noir, non veinées de blanc," with a reference to Corbière's "Fl. Norm. 2nd suppl. 1898," which is published in Bull. Soc. Linn. Normandie, 5 sér. i. pp. 150–200. The variety (p. 196) is there only characterized by the colour of the stamens and spadix, which is stated to correspond with that of *A. italicum*; no reference is made by Corbière to the veining of the leaves.—C. E. Britton.

REVIEWS.

Transpiration and the Ascent of Sap. By Henry H. Dixon. Pp. vi. + 216. London: Macmillan & Co., Ltd. 1914. Price 5*s.* net.

The problem of the forces which bring about the rise of water in tall trees is one which has vexed botanists for very many years. A number of theories have been put forward to explain the phenomenon, but few of them have stood the test of critical examination in the light of modern plant physiology, based as it is on physics and chemistry. Of late years the dispute has been narrowed down to two radically opposed views. On the one hand, there is the view that the water rises in the stem owing to some special activity of the living cells of that organ of the nature of a pumping action. On the other hand, we have the purely physical view, which is rapidly gaining ground, that the stem is a mere passive agent in the process of water-rise, providing merely the conducting channels through which the water is drawn by a pull from above, exerted as a result of evaporation from the leaves. This latter view is known as the cohesion theory of the ascent of sap, because it is based on the cohesion of water, a property which enables water columns under suitable conditions to transmit a longitudinal pull in the same way as a steel wire. This theory was first put forward in 1894 by Prof. Dixon and Dr. Joly. Since that time it has been supported by a large amount of further work by Prof. Dixon and has successfully stood the test of many years' criticism. Some years ago Prof. Dixon published, in an international journal, *Progressus Rei Botanicæ*, a full account of the cohesion theory of the ascent of sap with a

criticism of earlier theories. Naturally a large amount of material from that article appears in the present book, but the matter has been amplified throughout, and one finds incorporated the latest work of the author on the osmotic pressure in plant-cells, on the thermo-electric method of cryoscopy (developed with Mr. Atkins), and on the best method of extracting sap from plants.

In explaining the rise of water in plants as due to the purely physical phenomenon of the evaporation from the leaf-cells producing a pull on the water columns in the stem, we are led logically to the conclusion that a dead leafy branch kept under ordinary conditions should go on draining up water through the stem. It can be shown, however, that while a dead *stem* will go on conducting water for some time if certain precautions are taken, yet a dead *leaf* soon shrivels, although it may be in direct connection with conducting channels amply supplied with water. This difference between the behaviour of living and dead leaves in no way impugns the cohesion theory; it merely shows that for the continued absorption and loss of water by the leaves, some vital action is necessary, *i. e.* these phenomena are dependent on some physical and chemical relation which ceases to exist on the death of the cell. In the present work this point is brought out very clearly and the author lays stress on his observations, published in 1896, on transpiration in a saturated atmosphere and on the effect of different gases on transpiration. These point to a capacity of the leaves for the active secretion of water. It is probable, then, that this secretion plays an important part in transpiration of water under all conditions. If this is so, a vital theory of the ascent of sap is really the sound one, though not in the sense that it was originally used.

In spite of the title of his book the author deals very briefly with transpiration, only one chapter being devoted to that subject; there are many interesting problems of transpiration which might have been discussed. The author seems to believe in plunging his readers *in medias res*, for the book opens with a statement as to the relative water-loss from the two sides of a hypostomatous leaf; a botanist whose interest was mainly in morphology, and these are still in the majority, would be likely to be repelled by such a sudden introduction to the subject. In the list of papers at the end of Chapter 1, of the thirteen references, seven are undated. One notices also with regret that Prof. Dixon should lend his name to the misuse of "hypothecate" on p. 51. This word, which seems to be a special pitfall for men of science, is of course a legal term, having no relations with hypothesis other than those of sound and of very remote derivation. The explanations of experiments and of the physical phenomena concerned are nearly always extremely lucid, but it is not quite clear (on p. 6) why the loss of turgor brought about by death of the leaf-cells should affect the rate of water-loss except by causing collapse of the cells. These, however, are very small blemishes in an admirable book which provides in an accessible form a full account of an extremely important branch of botanical work

which the author has made his own. Without associating oneself with the unfortunate depreciation of the scientific activities of any other nation, one feels that it is certainly very creditable to our national science that to an Irish university we should owe the development of the only satisfactory explanation of the old-standing problem of the ascent of sap.

V. H. B.

Dansk Excursions-Flora. Tredie Udgave ved. C. H. Ostenfeld og C. Raunkiær. Kobenhavn og Kristiania. 1914.

This is a handy volume, well printed on rather thin paper. In the introductory Conspectus there is a rather novel way of treating all water and marsh plants, where Froken Agnete Seidelin brings them all together, and contrasts one with the other. Starting with *Lemna*, she passes in review all the submerged and marsh plants—for example, *Potamogeton densus* against *Veronica Beccabunga*, *Callitriche*, *Bulliarda*, &c. Out of each family or order these are taken, and so treated one by one. This Conspectus consists of twenty-three pages, and is here and there rather puzzling, as one finds *Bryonia* contrasted with *Lobelia*.

The Flora proper commences with the Ferns, and proceeds through Gymnosperms, Angiosperms, Monocotyledons to Dicotyledons, ending with Compositæ; in many Scandinavian Floras this last family is the first in order. After the Flora proper come seventeen pages of glossary and an index of ten pages. Compressed within the three hundred and thirty pages there is an excellent account of the Danish Flora, which might be expected, as the names of the authors would lead us to anticipate.

Naturally, in these days, one looks to the naming (or altering of names); but, on the whole, the names employed here are those in fairly general use. In *Juncus* it is rather a surprise to see *J. alpinus* split under three names. The grasses begin with *Dactylis*, *Bromus*, and *Festuca*—to us an unusual sequence. In orchids, *Anacamptis*, *Cæloglossum*, and *Plantanthera* are adopted. *Cerastium pumilum* is kept apart from *C. glutinosum*. *Stellaria Dilleniana* is used for *S. palustris*; *Spergularia* for *Lepigonum*; *Atriplex arenaria* for *A. laciniata*. *Batrachium* is adopted and has only five species, *B. aquatile* (L.) Wimm. being kept up. *Roripa* is used, but *Nasturtium* is restricted to *N. officinale*, which is named "*N. aquaticum* (L.) Karst." In *Saxifraga* we have *S. Hirculus*, *S. granulata*, and *S. tridactylites*; this gives a very good idea of the general constituents of the flora. *Rosa* is treated very shortly, while *Rubus* has eighteen pages (60 species). There are ten species of *Alchemilla*; *Œnanthe fluviatilis* Colem. is given. In *Pyrola* "(*Pirola*)" they possess *P. umbellata* and *P. chlorantha*, both wanting in our flora. *Primula elatior* (L.) Hill is used. *Utricularia ochroleuca* Hartm. occurs, but no notice is taken of Newman's reference to it as a hybrid. That unfortunate species *Galium sylvestre* becomes *G. pumilum* Murr. *Arctium* has three species besides *tomentosum*. *Hieracium* escapes with twelve, but *Taraxacum* has twenty species. Under *Senecio vulgaris* L., "var.

erectus-radiatus Trow." is mentioned—an evidence that the book is up to date. For an excursion flora some of the genera are treated very fully; notably *Rubus*, where the species are arranged under nine sections, beginning with "Cylactis" and ending with "Corylifolii," and also *Galium*, the species in which are certainly rather difficult to define.

A. B.

BOOK-NOTES, NEWS, &c.

The Pocket Synopsis of the Families of British Flowering Plants, by W. B. Grove, M.A. (Longmans, 1*s*. net.), is a neatly printed and cheap little book, produced in connection with the University of Manchester. It is "intended primarily to facilitate the determination of the families of British plants by students," and is doubtless admirably adapted to that end; but we fear its practical utility is questionable. A student is, we think, hardly likely to be contented with the mere knowledge of the family to which a plant belongs: he at any rate wants to know the genus, and would thus turn in preference (if he could afford it, for as we said last year (p. 186) when noticing it, its price—4*s*. net—is preposterously high) to Mr. Humphrey Carter's *Genera of British Plants*, in which the characters of the genera are given. But for those to whom a knowledge of the family suffices, Mr. Grove's little book (which like Mr. Carter's is based upon Engler's System) will certainly prove useful.

The *Westminster Gazette* of April 6 mentions a name which finds no place in the *Dictionary of English Plant-names*, although the plant itself is only too well-known: "The Smallholders' Union omitted from their list of plants proscribed for extermination what is perhaps the most pestilent of all weeds, the Whitlow-pepperwort (*Lepidium Braba*) (*sic*), which came to us from a district not very distant from French Flanders. When our troops disembarked at Ramsgate after the disastrous Walcheren Expedition of 1809, the straw and other litter on which they had slept aboard ship were thrown into an old chalk-pit, and afterwards carted into the fields for manure by a farmer named Thompson. A huge crop of the plant thence called 'Thompson's curse' sprang up, spread right across England to South Wales, and is now attacking the North Country. The roots of this terrible pest are many feet in length."

At the meeting of the Linnean Society on March 18th, the Botanical Secretary briefly epitomised a paper by Messrs. J. A. Wheldon, F.L.S., and W. G. Travis, on the Lichens of South Lancashire, of which the following abstract was supplied by the authors. In the introductory part of their paper, the authors, after referring to the enormous industrial development and increase of population which took place in South Lancashire during the last century, point out the deterioration of the flora which ensued, and then proceed to detail the results of their study of the effects of air-pollution by coal-smoke on the cryptogamic

vegetation, and more particularly on lichen-growth. They are of opinion that South Lancashire exhibits the deleterious effects of smoke on vegetation to a higher degree over a larger area than is, perhaps, the case in any other part of Great Britain. They think, however, that these adverse conditions have now reached their maximum. It has, therefore, been considered of importance exactly to describe the state of the lichen-flora as it at present exists, so that data may be afforded for purposes of comparison at some future time when a regenerated lichen-flora has developed under purer atmospheric conditions. The authors show the extent to which the various classes of lichens, more especially those of corticolous and rupestral habitats, have suffered; and in this connection the marked influence of a calcareous substratum in neutralizing the deleterious effects of smoke on lichen growth is discussed. Particular attention has been paid by the authors to the lichens of the coast sand-dunes, the lichens of the sand-dune plant formation in Britain not having hitherto been specially investigated. The characteristic lichens of these dunes and their ecological relations are described. A systematic list of all species of lichens found in the vice-county is given; and four new species and two new varieties are described.

At the Royal Horticultural Society's meeting on March 2nd Dr. Fothergill lectured on the scientific pressing of flowers, describing an apparatus which he has invented for the purpose; and Colonel Rawson discussed the artificial variations which may be produced in the form and colour of flowers by special screening. Colonel Rawson showed a number of specimens of the common Nasturtium in which variations in colour and form had been produced by subjecting the plants to varied lights. Purple blossoms were obtained from a plant bearing originally yellow flowers; while an orange Nasturtium had been made to bear chocolate-coloured flowers. In other cases flowers had been produced bearing two spurs and aerial tubers. Screens to regulate the light had been used made of iron or asbestos, but it was preferable to use natural objects out-of-doors, such as shrubs and trees, or under glass the posts and shelves of the greenhouse. Yellow flowers were obtained by allowing the plant to be reached only by light sun; the strongest sunlight produced purple and intermediate light red. This was true for seasonal as well as diurnal colour changes.

The recently issued (1914) volume of the *Proceedings of the Holmesdale Natural History Club* (1910–13) contains "Surrey Plant Records" for those years by Mr. C. E. Salmon (who, we are sure, did not see a proof), and a lecture by Miss Ethel Sargant on "The Native Countries of our Spring Bulbs," which seems to us a model of what lectures should be. The pages are headed "Proceedings" throughout—a more useless indication could hardly be devised.

We have received the Report of the Watson Botanical Exchange Club for 1913–14, and hope to notice it in our next issue.

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THE

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BRITISH AND FOREIGN

EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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1-6. Steiractinia mollis *Blake*. 7-8 S. Schlimii *Blake*.
9. S. grandiceps *Blake*.

STEIRACTINIA, A NEW GENUS OF COMPOSITÆ.

By S. F. Blake, A.M.

(Plate 539.)

Steiractinia, n. genus Verbesinearum *Perymenio* proximum, a quo radiis neutralibus differt.—Capitula radiata, floribus radii neutralibus disci hermaphroditis fertilibus. Involucrum hemisphæricum, squamis 3–4-seriatis paullum gradatis (exterioribus brevioribus) vel subæqualibus ; extimis paucis (ca. 4) ovalibus ad oblongis obtusis vel acutis herbaceis infra medium interdum in basin angustiorem subinduratam contractis strigosis vel strigillosis; interioribus sensim membranaceoribus paullum siccis; intimis apice plerumque eroso-ciliolatis. Receptaculum complanatum, paleis complicatis subscariosis subacutis infra apicem angustatis flores amplectentibus onustum. Corollæ radii ligulatæ, patentes, vix bidentatæ, flavæ, neutrales ; eæ disci regulares, flavæ, tubulosæ, 5-nerviæ, glabræ vel in dentibus ciliatæ, tubulo in faucem sensim vel subabrupte ampliato, limbo 5-dentato. Antheræ basi minute sagittatæ apice appendice triangulari-ovata obtusa munitæ. Styli rami longi lineares superne hirti in appendicem sublongam oblongo-lanceolatam hirtam desinentes. Achenia radii inania ; ea disci valde lateraliter compressa oblonga anguste (an semper ?) alata ; alæ ad apicem patelliformem pappiferum achenii adnatæ. Aristæ pappi numerosæ (ca. 16–40) liberæ tenues sursum spinulosæ inæquales vel subæquales (duabus longioribus in angulis achenii exceptis) caducæ.—Frutices ramosi in boreali Austro-America incolæ. Folia opposita 3-nervia ovata ad oblongo-ovata serrulata vel subintegra ± pubescentia. Capitula mediocria vel magna in apicibus ramorum in pedunculis monocephalis axillaribus et terminalibus subternate cymosa. Achenia ± appresse pubescentia.—Species typica *S. mollis*.

The genus *Steiractinia* (στειρος, *sterile*, and ἀκτίς, *ray*, from the neutral ray-florets) is closely related to *Perymenium* Schrad., from which it differs in the neutral ligules and strongly compressed disk achenes usually bearing a narrow wing adnate to the saucer-shaped pappus-bearing apex of the achene. In *Perymenium* the rays are always fertile, and the disk achenes strongly thickened and nearly always wingless (winged sometimes in *P. grande* Hemsl. and in *P. Mathewsii* Blake). Furthermore, *Perymenium* is a distinctively Mexican and Central American genus, the only South American species being *P. Klattii* Rob. & Greenm. and *P. lineare* Blake from Columbia, and *P. Mathewsii* Blake and *P. serratum* Blake from Peru, while the six known species of *Steiractinia* are Columbian, with the exception of *S. mollis*, the type species, known at present only from Ecuador. *Steiractinia* differs from *Perymenium* as does *Oyedæa* from *Zexmenia*, or *Aspilia* from *Wedelia*, in possessing neutral instead of fertile rays, and this difference, taken with the much more compressed achene with somewhat different apex, fully entitles it to generic rank

next to *Perymenium*, to which it is much more closely allied than to *Melanthera* or its neutral-rayed analogue *Echinocephalum* Gardn.

None of the six species here referred to *Steiractinia* appears to have been previously described, unless one or both of the two species of *Oyedæa*, published by Triana in 1858 (Ann. Sci. Nat. ser. 4, ix. 38–39), the types of which (*Triana*, 1520, specimens No. 4 (*O. helianthoides*) and No. 5 (*O. Cuerviana*)) I have not seen, belong here. Other species are doubtless to be found in herbaria among the genera *Oyedæa* and *Perymenium*.

Key to Species.

1–4. Disk 1·5–1·8 cm. thick or less; outer phyllaries 5 mm. or less broad.
  1. Stem and under leaf-surface densely and softly long-pilose; Ecuador ..... 1. *mollis*.
  2–4. Stem and under leaf-surface with shorter less dense pubescence; Columbia.
    2–3. Outer phyllaries oblong or oblong-lanceolate, acute, not contracted below.
      2. Involucre 6–7 mm. high ..... 2. *Schlimii*.
      3. Involucre 11–12 mm. high ..... 3. *oyedæoides*.
    4. Outer phyllaries oval, abruptly contracted below the middle ..... 4. *Trianæ*.
5–6. Disk 2 cm. broad; outer phyllaries 5–8 mm. broad.
  5. Outer phyllaries broadly oblong, not narrowed below ..... 5. *ocanensis*.
  6. Outer phyllaries oval, strongly contracted below the middle ..... 6. *grandiceps*.

1. **S. mollis,** n. sp. Frutex 2–3 m. altus ramosus. Rami validi dense molliterque lanato-pilosi. Folia opposita ovata vel ovato-lanceolata acuminata basi cuneata obscurissime appresse serrulata 3-nervia supra viridia rugulosa subaspere strigosa infra dense molliterque lanato-pilosa juventate subsericea 5·5–11 cm. longa 1·6–4·3 cm. lata. Petioli lanato-pilosi 3·5–6·5 mm. longi complanati immarginati. Capitula in pedunculis dense pilosis 0·7–4 cm. longis 1-cephalis ternate dispositis ramos et ramulos terminantibus 4–5 cm. lata. Discus 8–10 mm. altus 1·5 cm. dimetente. Involucri 3-seriati 11–13 mm. alti squamæ gradatæ extimæ ca. 4 oblongo-ovales obtusæ appresse pilosæ ± glandulosæ supra subherbaceæ 1 cm. longæ 3·7 mm. latæ; mediæ longiores ovales vel spathulato-ovales submembranaceæ rotundatæ superne ciliato-dentatæ strigillosæ et glandulosæ; intimæ similes membranaceæ fructu discum subæquantes. Radii ca. 10 flavi oblongi vel oblongo-ovales 2 cm. longi 4–9 mm. lati dorso subsparse pubescentes neutrales. Corollæ disci flavæ glabræ tubulo sensim in faucem ampliato 5·8 mm. longæ (tubulo 2–2·2 mm.). Paleæ subscariosæ subcarinatæ subacutæ margine ciliolatæ e latere subdentatæ 7·5–8 mm. longæ. Achenia submatura paullum incrassata brunneo-fusca maculosa puncticulate multissimo-striatulata in

margine et medio lateris sparse appresse pubescentia basi crustaceo-marginata non alata 3·5 mm. longa 1·5 mm. lata; aristæ pappi ca. 30 subæquales spinulosæ caducæ 2–2·5 mm. longæ in apice achenii elevato subcupuliforme insidentes.

Ecuador: bushy branched shrub 2–3 m. high, with greyish green foliage and bright yellow flowers, edges of woods, Tungaragua, alt. 1500–2500 m., December 14th, 1880, *Lehmann*, 453 (Brit. Mus.); western side of Pichincha, alt. 2135 m., *Jameson*, 734 (types, Brit. Mus.).

Lehmann's plant has been recorded by Klatt (Engl. Jahrb. viii. 45 (1886)) as *Calea Leontophthalmum* Less. (= *Calea peruviana* (H. B. K.) Benth. in herb., n. comb. (*Leontophthalmum peruvianum* H. B. K. Nov. Gen. iv. 296, t. 409 (1820)), with which it has no particular relationship. The name there and in the *Index Kewensis* ascribed to Lessing was never published by him; in the *Synopsis Generum Compositarum* (p. 241 (1832)) Lessing merely refers the genus *Leontophthalmum* Willd. to *Calea* as a subgenus, and cites *Leontophthalmum peruvianum* Kunth as its single species. The name *Calea Leontophthalmum* first appears in DC. *Prodromus* (v. 675 (1836)), and, though cited by De Candolle as of "Less. syn. 241," should be quoted as *Calea Leontophthalmum* DC., being there first published. *Linden*, 34, in the British Museum from Triana's herbarium, without locality, appears to be identical with *Calea peruviana* (ex char.).

2. **S. Schlimii,** n. sp. Frutex ramosus. Rami teretes dense appresse pubescentes ± glandulosi demum subglabrati. Folia ovata vel ovato-lanceolata acuminata basi cuneata obscure appresso-serrulata distincte 3-nervia supra viridia aspere tuberculato-strigosa subtus pallidiora subdense submolliterque pilosula ± glandulari-adspersa ad 6 cm. longa 3·3 cm. lata. Petioli immarginati dense appresse pubescentes 4·5–9 mm. longi. Capitula satis numerosa in apicibus ramorum ramulorumque ternate disposita 3·5 cm. lata; pedicelli 1–2·8 cm. longi subappresse pubescentes. Discus 9– (fructu) 11·5 mm. altus 9–10 mm. dimetente. Involucri 3-seriati 6–7 mm. alti squamæ subæquales; extimæ oblongæ vel oblongo-ovatæ subobtusæ appresse pubescentes et glandulosæ supra herbaceæ basi subsiccatæ apice subungulatæ; mediæ similes latiores; intimæ tenuiores submembranaceæ dorso minutissime tuberculato-strigillosæ margine ciliatæ supra herbaceæ infra subinduratæ. Radii 12 flavi oblongi dorso glanduloso-adspersi neutrales vix bidentati 16·5 mm. longi 3·5 mm. lati. Corollæ disci flavæ glabræ (pilis paucis in dentibus exceptis) 5·3 mm. longæ (tubulo 1·3 mm.). Paleæ scariosæ carinatæ subobtusæ angustæ ciliolatæ 7·5 mm. longæ. Achenia matura vix incrassata olivaceofusca ut ala maculosa e basi ad apicem anguste alata ala ciliata ad apicem achenii patelliformem pappiferum adnata 3·7 mm. longa 1·4 mm. lata; aristæ pappi ca. 22 tenues spinulosæ ad 2 mm. longæ (duæ in angulis longiores 3·5 mm. longæ) caducæ.

Columbia: Dept. Santander, alt. 1190 m., Ocana, October, 1846–1852, *L. Schlim* (distr. *Linden*, 247) (Brit. Mus., Kew).

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Columbia: Dept. Santander, alt. 1190 m., Ocana, October, 1846–1852, *L. Schlim* (distr. *Linden*, 247) (Brit. Mus., Kew).

3. **S. oyedæoides,** n. sp. Frutex 1·3–3·1 m. altus ramosus. Rami striati vel subteretes subdense appresse pubescentes ætate subglabrati; basibus pilorum tuberculatis persistentibus. Folia ovata acuminata basi rotundato-cuneata obscure appresso-serrulata supra obscure viridia aspere tuberculato-strigosa subtus vix pallidiora subaspere pilosula glandulosi-adspersa 3-nervia subvenoso-reticulata 5·5–10 cm. longa 2·1–4·3 cm. lata. Petioli vix marginati dense appresse pubescentes 6–14 mm. longi. Capitula in apicibus ramorum et ramulorum in pedunculis dense appresse pubescentibus monocephalis 2–5 cm. longis subternate disposita ad 3 cm. lata. Discus 9–11 mm. altus 10–15 mm. crassus. Involucri sub-4-seriati 11–12 mm. alti vix gradati squamæ extimæ ca. 2 herbaceæ oblongo-lanceolatæ subacutæ strigosæ ad 2·3 mm. latæ; proximæ oblongæ tenuiores supra herbaceæ basi subinduratæ strigosæ; proximæ oblongo-ovales apice membranaceæ rotundatæ strigillosæ margine eroso-ciliatæ; intimæ similes tenuiores. Radii ad 12 neutrales flavi oblongi in venis dorsi pubescentes 1–1·5 cm. longi 2·5–5 mm. lati. Corollæ disci flavæ glabræ (dentibus ciliatis exceptis) 4·5– (ætate) 6 mm. longæ (tubulo 1·2– (ætate) 2·2 mm.). Paleæ subscariosæ subacutæ carinatæ in carina et margine spinulosæ 6 mm. longæ (immaturæ). Achenia immaturissima sparse pubescentia; aristæ pappi tenues spinulosæ numerosæ subæquales (duabus longioribus exceptis) caducæ.

Columbia: without locality, 1851–1857, *Triana*, 1365 (types, Brit. Mus.); *Triana*, without number (Kew); roadside, alt. 1220–1830 m., October 11th, 1877, near Ocana, *Kalbreyer*, 292 (Kew).

4. **S. Trianæ,** n. sp. Frutex ramosus. Caulis dense appresse pubescens pilis basi incrassatis. Folia ovata acuta basi late cuneata obscure appresso-serrulata 3-nervia supra obscure viridia dense tuberculato-strigosa pilis (eis venas secundum exceptis) plerumque ætate deciduis subtus pallidiora submolliter pilosula glanduloso-adspersa leviter venoso-reticulata 5·5–10 cm. longa 1·9–4·7 cm. lata. Petioli immarginati dense appresse pubescentes 7–20 mm. longi. Capitula in apicibus ramorum et ramulorum in pedunculis 2·2–4·2 cm. longis monocephalis dense subappresse pubescentibus subternate disposita ad 3·8 cm. lata. Discus 1 cm. altus 1·3–1·8 cm. dimetente. Involucri 3-seriati 13 mm. alti paullum gradati squamæ extimæ 4 herbaceæ ovatæ subacutæ infra medium subabrupte in basin angustiorem subinduratam contractæ tuberculato-strigosæ 9·5–10 mm. longæ 3·5–4·5 mm. latæ; mediæ longiores oblongo-ovales apice rotundatæ submembranaceæ supra subherbaceæ strigillosæ ciliolatæ; intimæ membranaceæ apice rotundatæ denticulato-ciliolatæ dorso glabræ vel subglabræ. Radii flavi anguste oblongi in venis dorsi pubescentes neutrales 15·5 mm. longi 3 mm. lati. Corollæ disci flavæ glabræ 5 mm. longæ tubulo 2 mm. longo in faucem sensim ampliato. Paleæ subscariosæ subobtusæ carinatæ (carina paucispinulosa) in margine denticulato-spinulosæ 9·5 mm. longæ. Achenia matura olivaceo-fusca nigro-maculata parum incrassata in uno latere angustissime alata; aristæ pappi ad 16 tenues spinulosæ inæquales longiores ad 2·3 mm. longæ.

COLUMBIA: alt. 1900 m., Pasca, 1851–1857, *Triana*, 1363 (Brit. Mus., Kew).

5. **S. ocanensis,** n. sp. Frutex ramosus 2–2·6 m. altus. Rami validi dense appresse pubescentes pilorum basibus valde incrassatis persistentibus densissimis. Folia oblongo-ovata acuta ad acuminata basi cuneata subdistincte multiserrata (dentibus ca. 40-jugis subpatentibus vel ± depressis) supra obscure viridia dense tuberculato-strigosa et -strigillosa subtus pallidiora aspere hispido-pilosula pilis basi sæpe tuberculatis penninervia vix 3-trinervia ad venas dense appresse pubescentia 8–16 cm. longa 2–4·8 cm. lata. Petioli anguste marginati 6–15 mm. longi strigosi. Capitula pauca (ca. 5) axillaria et terminalia in pedunculis monocephalis nudis vel 2-bracteatis dense appresse pubescentibus 5–10 cm. longis ad 5 cm. lata. Discus ad 1·5 cm. altus 2 cm. crassus. Involucri 4-seriati ad 1·8 cm. alti squamæ paullo gradatæ extimæ late oblongæ obtusæ herbaceæ tuberculato-strigosæ 12–21 mm. longæ 5–6 mm. latæ; proximæ similes latiores (usque ad 7·5 mm. latæ); proximæ membranaceæ oblongo-ovales apice rotundatæ tuberculato-strigillosæ subelongatæ laxæ; intimæ membranaceæ multo breviores et angustiores dorso glabræ vel minute tuberculatæ margine eroso-ciliolatæ. Radii ca. 12 oblongi neutrales flavi subglabri 2·3 cm. longi 6 mm. lati. Corollæ disci flavæ glabræ maturitate 8·2 mm. longæ (tubulo 3·2 mm.). Paleæ subscariosæ e latere 1–2-dentatæ subacutæ ad apicem minute pubescentes 9·2–10·8 mm. longæ. Achenia radii trigona in angulis ciliata pappo ut in eis disci; disci valde compressa anguste alata (ala cum apice patelliforme achenii auriculiformiter conjuncta) olivaceo-fusca nigro-maculata vel nigrescentia in margine ciliata in lateribus sparse pilosa 5–5·5 mm. longa 1·6–2·4 mm. lata. Aristæ pappi ad 40 tenues spinulosæ paullo inæquales caducæ 2–2·5 mm. longæ.

COLUMBIA: Dept. Santander, alt. 1190 m., Ocana, September,* 1846–1852, *L. Schlim* (distr., *Linden*, 183) (types, Brit. Mus., Kew); open spaces, alt. 1525–1830 m., Ocana, November 16th, 1879, *Kalbreyer*, 1238 (Kew).

6. **S. grandiceps,** n. sp. Frutex ramosus. Rami striatuli validi subdense appresse pubescentes pilis basi tuberculatis. Folia ovata acuminata basi rotundata vel rotundato-cuneata obscurissime serrulata (dentibus minutis appressis ad 25-jugis) supra viridia tuberculato-strigosa pilis mox deciduis aspera pilorum basibus persistentibus subtus subaspere pilosula 3-nervia majora 10·5–13 cm. longa 4·5–6·2 cm. lata. Petioli complanati immarginati dense appresse pilosi 8–10 mm. longi. Capitula pauca 5 cm. lata in apicibus ramorum et ramulorum in pedunculis monocephalis dense appresse pubescentibus 3·3–7 cm. longis solitaria vel ternata. Discus 1·5 cm. altus 2 cm. crassus. Involucri 3-seriati 1·4–1·6 cm. alti squamæ paullum gradatæ extimæ ca. 4 late ovato-ovales herbaceæ obtusæ 3-nerviæ tuberculatæ et sparse strigillosæ infra

* The specimen in Kew Herbarium is labelled "Oct., 1856."

medium in basin induratam angustiorem contractæ ad 10 mm. longæ 8 mm. latæ; mediæ longiores latiores (ad 1 cm.) obtusiores membranaceo-herbaceæ basi subinduratæ 5-nerviæ sparsius tuberculato-strigillosæ; intimæ similes membranaceæ apice rotundatæ minute strigillosæ margine ciliolatæ. Radii 12 flavi neutrales oblongo-ovales glabri 2 cm. longi 8 mm. lati. Corollæ disci flavæ glabræ 7·5 mm. longæ (tubulo 2·5 mm.). Paleæ subscariosæ subacutæ in margine dentatæ apice minute ciliolatæ 10·5 mm. longæ. Achenia immaturissima sparse pubescentia; aristæ pappi numerosæ (ad 30) inæquales spinulosæ.

Columbia: Dept. Tolima, alt. 1500 m., Ortega, 1851–1857, *Triana*, 1364 (Brit. Mus., Kew).

Explanation of Plate 539.

Figs. 1–6. *Steiractinia mollis* Blake (*Jameson*, 734). 1. Portion of plant, nat. size. 2. Disk corolla, 5 ×. 3. Androecium, 5 ×. 4. Style, 5 ×. 5. Style-tip, considerably enlarged. 6. Pale, 5 ×. 7–8. *S. Schlimii* Blake (*Schlim*, 247). 7. Achene, 5 ×. 8. Single awn of pappus, 10 ×. 9. *S. grandiceps* Blake (*Triana*, 1364). Unopened head, three-quarters nat. size.

SCOTTISH HIGHLAND PLANTS OBSERVED IN 1914.

By the Rev. E. S. Marshall, M.A., F.L.S.

During last July my wife and I revisited Crianlarich, v.c. 88 Mid-Perth (a former "happy hunting-ground"), after a long interval, and for one week out of three we were joined by our old friends Mr. and Mrs. F. J. Hanbury. Special attention was paid to the critical hawkweeds; these were in many cases less numerous than usual, and slightly abnormal, owing to the dry season. An excursion to Ben Vorlich, v.c. 99 Dumbarton—a hill which would, I believe, repay further examination—yielded a few novelties for that county. A special expedition was made to Glen Spean, v.c. 97 W. Inverness, in order to procure (for figuring) *Saxifraga cespitosa* L., one of the very scarcest British species; only two tufts were observed, one of which was left undisturbed. It should be noted that Glen Falloch, in which some fresh ground was worked, drains into Loch Lomond, and belongs, geographically, either to v.c. 99 or v.c. 87 W. Perth; but I have followed H. C. Watson, who apparently included it in v.c. 88.

Thanks are due to Mr. Arthur Bennett for general help, and to the Rev. E. F. Linton for many suggestions or corrections on *Hieracia*. Vicecomital records which seem to be new are starred.

Nymphæa alba L. 88. The variety with small blossoms and foliage is abundant in pools and lochans near the railway crossing Rannoch Moor. In all the flowers examined the stigmatic rays were twelve (about sixteen in the type). It may be the var. *minor* Besl. Hort. Eystt. Vern. Ord. vii. 1. 3. f. 1., mentioned in DC. *Prodromus*, i. 115.

*99. *Cochlearia micacea* E. S. Marshall. Stony rill on the east

side of Ben Vorlich ; the more frequent short-fruited form. Pods veinless ; leaves thick, shining, dark green.

Silene acaulis L. 88. A pretty form, with bibracteate pedicels from one to two inches long, occurs at 2500 ft. on Beinn a Chroin, Glen Falloch. It may be the var. *dianthifolia* Reichb., Fl. Excurs., p. 817, thus described in Rouy & Foucaud, Fl. de France, iii. p. 129 :—" Pédoncules presqu'aussi longs que dans la var. *β*. [*elongata* DC.], et pourvus vers le milieu de deux bractées opposées ; plante plus lâche ;" but the bracts are occasionally lower down or higher up. The lax habit was very marked. I had not met with it before.

Cerastium Edmonstonii Ostenfeld (*arcticum* Lange, *pro parte* ; *latifolium* Sm., non L.). 97. Sparingly, on granite, at 3400 ft., Stob Coire an Easain ; associated with *C. cerastoides* Britton (*trigynum* Vill.).

Saxifraga hypnoides L. Large-flowered alpine states were noted as follows : 88. Corrie Ardran ; Beinn a Chroin. 99. East side of Ben Vorlich.

Galium saxatile L. var. *alpestre* Meyer. A narrow-leaved plant, easily mistaken for *G. asperum* Schreb. when fresh, was found on Ben Vorlich at 2300 ft. I have seen this on other Scottish mountains ; and it is identical with specimens gathered by Mr. J. E. Griffith on Ystolion Duon, v.c. 49 Carnarvon, which Mr. Bennett (Bot. Exch. Club Report for 1893, p. 416) thought to be rightly named.

Hieracium anglicum Fr., var. *amplexicaule* Backh. (*H. cerinthiforme* Backh. *in litt.*). 88. A very handsome form of this, with almost pure yellow styles and evenly denticulate foliage, grows in Coire a' Chuillin, Glen Falloch, from 2000 ft. to 2200 ft.

H. langwellense F. J. Hanb. 97. Granite rocks on the west side of Ben an Socaich at 2500 ft. ; with narrower leaves than the typical lowland plant, and yellow styles.

H. holosericeum Backh. 88. Low cliffs at the north-east base of Ben Chaluim ; both the type and a very curious form (or state), light green, with very long petioles—up to five inches. 97. Ben an Socaich. 99*. Scarce on Ben Vorlich.

H. globosum Backh. 97. A few specimens, mixed with my gathering of *H. alpinum* L., were collected on Ben an Socaich.

H. curvatum Elfstrand. 97. Frequent on the west side of Ben an Socaich, from 2200 ft. to 2700 ft., or even higher. One specimen of *H. senescens* was observed here.

H. Marshallii Linton. 88. Extremely rare on Beinn a Chroin between 2300 ft. and 2500 ft. ; a good match with my original Forfarshire gathering.

H. callistophyllum F. J. Hanb. 97. A careful study of the various plants collected last season strengthens my opinion that this species belongs to the section *Alpina Nigrescentia*, and not to *Vulgata Silvatica*. Reduced alpine states, rather plentiful at 2300 ft. to 2500 ft. on Ben an Socaich, have leaves closely resembling those of typical *H. nigrescens* Willd, but approaching *H. Marshalli*, its nearest ally, in head-clothing.

Var. *cremnanthes* F. J. Hanb. 97. Ascends to 2500 ft. on Ben an Socaich; but much rarer there than in Coire Coille, lower down the same valley.

Var. *glandulosum* F. J. Hanb. 88. Beinn a Chroin, at 2300 ft. to 2500 ft.; Ben Chaluim, at 2200 ft. Always (according to my experience) a scarce plant; this is quite as near to *H. Marshalli*, under which it was first described, as to *H. callistophyllum*.

H. sinuans F. J. Hanb. 88. Locally plentiful on one of the lower cliffs of Ben Chaluim; growing mostly out of reach.

H. nigrescens Willd. var. *gracilifolium* F. J. Hanb. 97. Very rare on Ben an Socaich, at 2500 ft.

H. atratum Fr. 88. An interesting monocephalous (probably seedling) state was met with at 2200 ft., on the north side of An Caisteal, Glen Falloch. 99*. Ben Vorlich, at 2300 ft., sparingly.

**H. centripetale* F. J. Hanb. 99. Ben Vorlich, at 2300 ft.; practically identical with the Moffat form (No. 6 of the Lintons' Set), which has fewer glands and many more simple hairs on the heads than the original one of the Cairngorms.

H. Sommerfeltii Lindeberg. 88. Ben Chaluim; the usual yellow-styled plant of the Breadalbanes.

Var. *tactum* F. J. Hanb. 97. Well marked, but very rare, on Ben an Socaich (2500 ft.).

**H. silvaticum* Gouan var. *asymmetricum* Ley. 88. A solitary specimen from the Falloch River (about 1300 ft.), which long puzzled me, agrees very well with the Sutherland form placed here by the Rev. W. R. Linton, excepting that it has ligules apparently glabrous-tipped; this may be due to its being washed by the stream.

H. ciliatum Almq. 88. Plants very near the form from Ben Hope occur on Beinn a Chroin; E. F. L.'s suggestion seems to be right.

H. pictorum Linton. 88. Cliffs and rock-ledges (1700 ft. to 1800 ft.), Coire a' Chuillin, in considerable quantity.

H. rivale F. J. Hanb. var. *dasythrix* Linton. 88. Quite common in Glen Falloch (Beinn a Chroin, Coire a' Chuillin, &c.), ranging from 1800 ft. to 2500 ft.; Ben Chaluim. 99*. Ben Vorlich.

H. rotundatum Kit. 88. River Falloch and Beinn a Chroin (1300 ft. to 2500 ft.); rocky streamlet (1800 ft.) below the southern base of Ben Chaluim. This species varies much in the amount of eglandular hairs on the heads, which is sometimes quite small. Most of the gatherings made in the Fortingal district, and recorded in Journ. Bot. 1914, p. 166, are (as I at first thought) this, rather than *H. variicolor* Dahlst.; *e.g.* my Nos. 3844 and 3850.

**H. anfractiforme* E. S. Marshall. 99. Streamlet on the east side of Ben Vorlich, at 2300 ft.; leaves abnormally hairy, owing to drought (I noticed the same thing in Corrie Ardran, one of its original stations).

Rhinanthus stenophyllus Druce. 88. Common in meadows by the River Dochart, above Crianlarich.

R. borealis Druce. 88. An Caisteal. 97. Ben an Socaich.

Here also occurred specimens with the broad, blunt foliage of this segregate, but producing some intercalary leaves, which may be a hybrid with the following. 99*. Ben Vorlich.

R. Drummond-Hayi Druce. 97. Ben an Socaich. 99*. Frequent in sedgy subalpine swamps (1500 ft. to 1800 ft.) below Ben Vorlich; as usual, the flowers (which are rather light, clear yellow in *R. borealis*) tended to orange.

Alnus glutinosa Gaertn. var. *microcarpa* Rouy. 97. About Spean Bridge. I think that this is the usual, if not the only form of the Highlands.

Juncus tenuis Willd. 88. Common by the high road from Crianlarich to Tyndrum (scarce on the Luib side); also for fully two miles alongside the Ardlui road, and (*Hanbury*, sp.) by a cart-track in Glen Falloch. Whether it was there some twenty years ago I cannot say; it is inconspicuous, and may have been overlooked.

J. biglumis L. 88. East side of Ben Douran; uncommon.

Scheuchzeria palustris L. 88. Knowing that this rarity had been found in the district, Mr. Hanbury and I spent an afternoon in search of it; he soon came across plenty, within a very short distance from Rannoch Station, in fine fruit. Later on, I found it equally abundant, though barren, in a neighbouring bog; so it is probably well distributed. I gather from Mr. A. H. Evans that the older localities were a few miles away.

Scirpus cespitosus L. var.? 88. Subalpine bogs near the head of Glenmore (west of Am Binnein), at 1700 ft.; locally plentiful. A slender plant, up to sixteen inches high, by no means densely tufted; stems few; sheaths grey, not shining; fruit mostly fallen by July 29th; white bristles long and conspicuous. This species is poorly represented in my herbarium, but I have nothing else like it.

Eriophorum angustifolium Roth var. *alpinum* Gaud. (*minus* Koch; *E. gracile* Sm., non Roth). 88. In profusion at 2300 ft. to 2500 ft. in rills and swampy ground, north-east corrie of Ben Chaluim.

E. latifolium Hoppe. 97. Lower slopes of Ben an Socaich, from 1300 to 1500 ft.

Carex magellanica Lam. 88. In one very restricted area on the west side of Glen More, at 1600 ft.; some stems were two feet high. Surely the altitude of 3000 ft. given for this in the *Flora of Perthshire* must be a misprint? It is only subalpine, I think.

C. limosa L. 88. Plentiful and often luxuriant in bogs near Rannoch Station; *C. panicea* L. var. *tunnidula* Laestad. was much less common.

C. saxatilis L. 97. Ben an Socaich; very local. The form (it certainly deserves no higher rank) *dichroa*, with green utricles, but drying darker, grows mixed with the type on Beinn a Chroin and Ben Chaluim, 88.

Deschampsia alpina Roem. & Schultes. 97. Sparingly on Stob Coire an Easain, at 3400 ft.; viviparous, as usual.

Poa glauca Vahl. 88. Mr. Bennett agrees with me in placing under this a peculiar-looking grass, having a narrow inflorescence, dark purple glumes, and involute leaves, which was found on the east side of Ben Douran, from 2800 ft. to 3000 ft. Roots were sent home; so I hope to test it by cultivation. Intensely glaucous.

P. nemoralis L. var. **Parnellii* Hook. & Arn. 88. Rocks on the north side of An Caisteal, at 2300 ft.; the name was suggested by Mr. S. H. Bickham, and Mr. Bennett concurs.

BRITISH FORMS OF HYPERICUM HUMIFUSUM AND H. LINARIIFOLIUM.

By H. W. Pugsley, B.A.

So long ago as 1902 my interest in *Hypericum humifusum* and *H. linariifolium* was aroused through collecting near Land's End a plant curiously intermediate between them, which for a long time I was quite unable to name. Before seeing this plant I had supposed the two species to be widely different, but a reference to Rouy & Foucaud's *Flore de France* showed that they were not always so distinct as I had thought, and a wider experience has since convinced me that in Britain, as abroad, both plants are very variable. I will now attempt to define the different forms with which our islands may be credited.

Hypericum humifusum was described by Linnæus (Sp. Plant. p. 785 (1753)) as "floribus trigynis, caulibus ancipitibus prostratis," with citations from Haller (*H. humifusum foliis perforatis punctis in margine nigris*), Bauhin, and Clusius, which suffice to show that the name has been correctly interpreted by subsequent authors.

A specimen exists in the Linnean Herbarium, moreover, which confirms this view. It is a small, prostrate plant, with many slender branches springing from the rootstock; and though gathered late and showing more fruits than flowers, its habit, small oval leaves and short capsules are quite characteristic, as are also the unequal, oblong sepals. These latter, which are quite devoid of a glandular fringe, are mostly rounded-obtuse, and are entire except in one or two of the latest flowers, where they show traces of serrulation.

In 1789 a closely related plant was described as *H. Liottardii* in Villars's Hist. Pl. Dauphiné, iii. p. 504, and tab. xliv., with a diagnosis, "H. minimum erectum bienne, foliolis calycinis inæqualibus sæpe quaternis." The figure shows a dwarf erect plant, branched throughout, closely resembling *H. humifusum* in foliage and flowers.

The following year *H. linariifolium* was published in Vahl's Symb. Bot. i. p. 65. This was described "*H. linarifolium* calycibus serrato-glandulosis, caule tereti erecto foliis linearibus obtusis glabris. *H. lusitanicum linariæ folio* Tourn. Inst. R. H. p. 256. In Bajona et Navarra Hispaniæ. Caulis supra radicem lignosus, teres, lævissimus, tenuis, simplicissimus, interdum basi remotus;

ramis altitudine fere caulis, pedalibus. Folia sessilia, remota, linearia, glaberrima, obtusa, revoluta, unguicularia. Pedunculi in summitate, filiformes, pauci, patentes, oppositi, plerumque triflori. Calycis foliola lanceolata, denticulis nonnullis setaceis, apice glandulosis, dentata. Corolla parva, calyce parum longior. Filamenta petalis breviora."

The first variety of *H. humifusum* to be distinguished appears to be *β magnum* of Bâtard's *Flore de Maine et Loire*, Suppl. p. 45 (1812)—a plant, found near Cholet, differentiated solely as being four times as large in all its parts as ordinary *H. humifusum*, with nearly cylindrical stems.

In 1824 Villars's *H. Liottardii* was reduced to a variety of *H. humifusum* in De Candolle's *Prodromus*, i. p. 549, where it is diagnosed, "Caule magis minuto erectiore bisannuo, floribus aliquando 4-partitis, calyce longiore."

A fourth plant was added to this group in Peterman's *Flora Lipsiæ*, p. 565 (1838) as *H. decumbens*, which is described thus: "Caulis filiformis, procumbens; folia ovali-oblonga; phylla lanceolata, acuta, glanduloso-serrulata. Habitus exacte *H. humifusi* et plerumque major; phylla angustiora, acuta, manifeste serrulata, serraturis apice glandulosis."

H. decumbens, as well as *H. Liottardii*, was reduced to a variety of *H. humifusum* in Reichenbach's *Icones*, vi. p. 68 (1844), where both forms are figured with the specific type; and a further variety of this species was published in Willkomm & Lange's *Flora Hispanica*, iii. p. 595 (1880), as *β australe*, which is described as "robustior, ½′ vel ultra l., sepalis dense glanduloso-dentatis," and seems to represent a relatively large plant with the facies of *H. australe* Tenore.

In Britain *H. humifusum* had been meanwhile described and figured in *English Botany*, 1226 (1803), where the plant is drawn with the glandular-serrate sepals of *H. decumbens*; and *H. linariifolium* was added to the British Flora by Babington in Eng. Bot. Suppl. 2851 (1840), his account of the plant being taken from specimens collected by himself in Jersey, and by Borrer at Cape Cornwall during the previous year. The figure was drawn from a Cornish example.

H. humifusum and *H. linariifolium* have been retained as distinct species in subsequent British Floras, and while Hooker (*Students' Flora*, ed. 3, p. 73 (1884)) places them in separate generic subsections based on the entire or dentate margins of the sepals, in accordance with the arrangement of De Candolle (Prodr. i. p. 548), Syme and Babington both recognize that gland-tipped ciliæ may occur in *H. humifusum* as in the other.

The connection of *H. humifusum* with *H. linariifolium* by a series of intermediate forms was suggested in 1892 by Dr. Gillot in *Revue de Botanique*, x. p. 653, where he writes: "Il me semble rationnel de regarder *H. humifusum* et *H. linariifolium* comme deux formes extrêmes d'un même type spécifique, reliées par les intermédiaires pour lesquels j'ai adopté l'épithète d'*ambiguum*." This variety *ambiguum* is placed under *H. humifusum*, and Gillot

says of it: "Les feuilles deviennent plus étroites, à pétiole dilaté et légèrement embrassant, à bords enroulés, à glandes pellucides raréfiées; les sépales se bordent de cils glanduleux allongés . . . à façon de se rapprocher beaucoup, par les individus robustes, d' *H. linariifolium* de l'ouest."

In 1893 an interesting paper was published by M. Brochon in Bull. Soc. Linn. Bordeaux, p. clxxiv., describing a variety *radicans* of *H. linariifolium*. This the author distinguishes by its stems not being completely cylindrical, its leaves not regularly semi-amplexicaul, its capsule but little longer than the sepals, and especially by the presence of short, leafy, barren shoots from the rootstock, which are erect at the time of flowering, but afterwards become prostrate and rooting. Although Brochon points out that this variety in some respects approaches *H. humifusum*, he considers the two species *humifusum* and *linariifolium* distinguishable in all their forms.

A variety of *H. humifusum*, similarly characterized by rooting stolons, was established in Bull. Soc. Bot. France, 43, p. 65 (1896), by M. Neyraut, under the same varietal name of *radicans*.

These forms are comprehensively dealt with in Rouy & Foucaud's *Flore de France*, iii. p. 344 (1896), where they are arranged thus :—

H. HUMIFUSUM L.

α. genuinum nob. . . . sépales entiers, munis de quelques points noirs. s. var. *adscendens* Neyr. in Bull. Soc. Bot. Fr. 43, p. 65.—Tiges ascendantes, peu diffuses.

β. decumbens Peterman (pro specie). *H. humifusum* v. *radicans* Neyraut, *l. c.* Plante plus robuste, à tiges de 15–35 cm., diffuses, . . . longuement couchées-radicantes . . . sépales entiers ou un peu dentés-glanduleux, les 3 plus grands acutiuscules.

γ. majus Rouy ap. Magn. Scrinia, p. 245 (1892); *H. humifusum β. australe* Willk. & Lange non *H. australe* Ten. Plante à tiges ascendantes ou dressées, de 25–30 cm.; feuilles largement sessiles; sépales densément dentés-glanduleux, plus aigus que dans les variétés précédantes.

δ. ambiguum Gillot, *l. c.* Tiges de 10–20 cm., ascendantes ou dressées . . . sépales acutiuscules, plus ou moins abondamment dentés-glanduleux. (Otherwise as diagnosed by Gillot.)

Une forme :—*H. Liottardi* Villars, *l. c.* (pro specie).

Subspecies 1 :—H. LINARIIFOLIUM Vahl, *l. c.* (pro specie).

α. genuinum nob. Plante de 30–40 cm., à tiges presque complètement dressées, feuilles largement linéaires, allongées (20–22 mm. de long sur 3–5 mm. de large), . . . fleurs en corymbe composé, lâche, . . . capsules 1½–2 fois plus longues que le calice.

β. approximatum Rouy ap. Magn. Scrinia, *l. c.* Plante de 10–20 cm., à tiges ascendantes, puis dressées; feuilles linéaires-oblongues, souvent très roulées en dessous . . . courtes (10–15 mm. de long sur 1–3 mm. de large); . . . fleurs en corymbe court, presque simple, pauciflore; . . . capsule environ 1 fois plus longue que le calice.

γ. *obtusisepalum* Coutinho in Bol. Soc. Brot. 12, p. 22; *H. linariifolium* Lam. Encycl. 4, p. 180. Port de la var. β. mais sépales elliptiques, obtus ou obtusiuscules, courts; capsule 2 fois plus longue que le calice.

δ. *radicans* Brochon, *l. c.* (Similarly described.)

ε. *montanum* Benth. Cat. Pl. Pyr. p. 921. Port et caractères de la var. β. mais feuilles plus ou moins ponctuées-pellucides.

Subspecies 2:—H. AUSTRALE Ten. (pro specie) Sylloge, p. 385; Fl. Nap. t. 179.

β. *angustifolium* Rouy ap. Magn. Scrinia, *l. c.*

γ. *minus* nob.

It will be seen that under this classification all of these plants form but a single species, presumably on the ground that all of them are connected by intermediate forms. Of these intermediates Gillot's var. *ambiguum* is clearly a link between *H. humifusum* and *H. linariifolium*, while var. *majus* seems more akin to *H. australe*. Gillot's type (Magnier, No. 2685), which is represented in Mr. C. Bailey's herbarium, is a slender, suberect and rather dwarf plant, with leaves as narrow as in some forms of *H. linariifolium*, but scarcely revolute, and, on an average, less amplexicaul, while its flowers and fruits are almost those of ordinary *H. humifusum*, except that the sepals are less unequal and varyingly glandular-ciliate throughout. The intermediate foliage described both by Gillot and by Rouy & Foucaud is not well shown in this plant, and is better seen in my Land's End specimen of 1902, and in a Herts example in Herb. Mus. Brit., both of which possess a similar calyx but even more strongly glandular, and I think must be placed under this variety. Other dwarfer examples in Herb. Mus. Brit., collected by C. A. Johns at the Lizard as *H. linariifolium*, seem likewise referable here, albeit their broader foliage indicates a passage to var. *majus*. All of these plants differ essentially from *H. linariifolium* in their smaller flowers and shorter styles and capsules. The var. *majus*, of which I have not seen authentic material, is described both by Rouy and in the *Flora Hispanica* as differing from common *H. humifusum* by its robuster and more erect habit, broadly sessile leaves, and acuter, densely fringed sepals. It seems to lack entirely the narrow leaves and large flowers, with long styles and capsules, usually seen in *H. linariifolium*, and appears rather to simulate *H. australe* Ten. and not to belong to the British Flora. As the districts of France and Cornwall where these two varieties of *H. humifusum* are known to occur produce also, or have produced, the other species which they respectively approach, it is possible that they are really of hybrid origin.

In contrast to these plants, the suberect variety *approximatum* of *H. linariifolium*, as shown in authentic specimens from Madeira and North-western France, seems to possess little of the features of *H. humifusum*. Though its leaves are shorter than in Vahl's type, they are equally amplexicaul and perhaps still more strongly revolute. Its flowers, too, are as large as in any other form of *H. linariifolium*, and though the capsule is said to be shorter

than in *a. genuinum*, it is yet very much longer than the calyx, and the long styles of *H. linariifolium* are equally evident. The Jersey plant commonly referred to *H. linariifolium* exhibits all of these characters, which appear to be quite constant, and Borrer's Cape Cornwall specimen differs only in its less revolute leaves—a difference very apparent in the Eng. Bot. Suppl. figure. Mr. Bailey possesses a French form with identical foliage collected at Le Mans. The intermediate individuals mentioned by Syme in Eng. Bot. ed. 3, ii. p. 156 (1864), as occurring in Jersey, were perhaps hybrids with *H. humifusum*, and a plant from St. Aubyn's Bay, with barren capsules and probably of this origin, may be seen in Herb. C. Bailey.

From these considerations, and as the varieties *obtusisepalum* and *montanum* (represented in Herb. Kew) show no greater affinity with *H. humifusum*, it may be doubted whether a series of forms can be found by which this species and *H. linariifolium* are really connected, and hence there seems insufficient ground for the reduction of the latter plant to a subspecies. Judging from dried material, *H. linariifolium* seems more closely connected with *H. australe* Ten., which is similar in habit, usual size of flower and length of styles and capsules, and differs only in its generally broader foliage, glabrous or more shortly fringed calyx and red-veined petals. The *exsiccata*, Bourgeau, Pl. d'Espagne, 1863, No. 237, and Bornmüller, Pl. Exs. Mader., 1900, No. 362, sent out as *H. linariifolium*, bear a strong resemblance to *H. australe*.

It should be observed that *H. linariifolium a. genuinum* R. & F., the form growing with us in South Devon, appears to differ from Vahl's type by its much larger flowers, for Vahl writes in his diagnosis, "Corolla parva, calyce parum longior." I have seen no specimen of *H. linariifolium* with so small a corolla as this, but Vahl's plant may be identical with *H. linariifolium β. parviflorum* Willk. & Lange, Fl. Hisp. iii. p. 594, which is likewise recorded from a locality in the North of Spain.

Reverting to *H. humifusum*, Rouy & Foucaud's *a. genuinum*, as described and as illustrated by Magnier, Fl. Sel. 2684, seems essentially identical with the plant of the Linnean Herbarium, although Linnæus's specimen, being gathered late, does not show well the characteristic entire and very unequal sepals, which are always most marked in the earlier flowers. In the case of the variety *decumbens*, the collaborators have extended Peterman's definition to include Neyraut's variety *radicans*, and to cover plants of similar habit with less glandular-serrate or even entire sepals, provided the three larger ones are subacute. I believe this to be in accord with the natural affinities of these plants, for the presence of stalked glands on the sepal margins is often inconstant and irregular, and entirely glandless specimens may be met with that clearly differ from the small, typical *a. genuinum*, and match exactly in every other respect the larger plant with regularly gland-fringed sepals. Such eglandular plants may be conveniently distinguished as forma *eglandulosum*. Mr. Bailey's collection also contains another striking form of this variety, in

which the stalked glands of the calyx are more or less wanting, while the habit is remarkably robust, with relatively stout and rigid stems, and broad, subamplexicaul, upper leaves. This will be separated as forma *crassum*.

It will have been noticed that Rouy & Foucaud do not allude to Bâtard's var. *magnum*, which has found its way into recent British lists, and has been adopted in Dr. Williams's *Prodromus*, x. p. 561 (1912), in preference to Peterman's *decumbens*. The herbarium at Kew possesses an immature example under this name, received by Gay from Bâtard, that seems varietally identical with var. *decumbens*, and accounts perhaps for the revival of Bâtard's name; but seeing that his description does not allude to its chief peculiarity—its subacute or gland-fringed sepals—and distinguishes it by features that may be purely vegetative and may equally characterize the specific type of *H. humifusum*, the identity of the Kew specimen can well be held a coincidence and no good ground for the adoption of Bâtard's name, which it may be urged was simply intended to apply to any very large state of *H. humifusum*. A very luxuriant form of *α. genuinum* that fits Bâtard's description occurs in Britain, especially in Wales, and may be worth distinguishing as forma *laxum*.

The remaining plant of this group, *H. Liottardii* Villars, is somewhat anomalous from its biennial or possibly annual duration. Except for this and its erect habit, it might be regarded as an extreme form of *H. humifusum α. genuinum*, of which it possesses the characteristic sepals, and it is perhaps best placed as a further variety of this species. The inclusion of this plant in the British Flora is apparently based on a short note by Dr. Drabble in Journ. Bot. xlv. p. 212 (1907), respecting two specimens collected in Kent and Cheshire, for which Villars's name was suggested. It may be doubted, however, whether these plants were not stunted examples of common *H. humifusum*, for it seems likely that where the true biennial var. *Liottardii* grows, it would be found in more or less abundance and be easily recognized on the spot.

It is possible that all of these variations of *H. humifusum* pass into each other, but I have seen no material that can be considered a passage from the varieties *ambiguum* and *majus* to *H. linariifolium*.

The two species under discussion, with their British varieties, may be described as follows. The sign ! under the distribution indicates that I have seen the plant *in situ*.

HYPERICUM HUMIFUSUM L. Sp. Pl. p. 785 (1753); Rouy & Foucaud, Fl. Fr. iii. p. 343 (1896).

Usually perennial, glabrous, with numerous prostrate or decumbent (rarely suberect), slender, often filiform stems, which are sometimes elongate and rooting at the nodes. Stems with two more or less distinct raised lines. Leaves oval or oblong, obtuse, usually subsessile but the lower ones less distinctly so, uppermost sometimes broader and semi-amplexicaul, all flat or nearly so, with distant marginal black dots and usually some small and scattered pellucid glands. Cymes variable, contracted and few-

flowered or with elongate branches; bracts usually glandless. Flowers about 10 mm. in diameter. Sepals unequal, the three larger generally elliptical or oblong, rounded-obtuse or acute, the two smaller lanceolate, more or less acute; all entire or sparingly serrulate, or occasionally mucronate with a solitary stalked gland, with black dots at least along the margins and less often also stalked, black glands at the serrulations; accrescent in fruit and the larger ones, especially in the lower flowers, frequently becoming foliaceous. Petals generally exceeding but rarely much longer than the larger sepals, yellow with black marginal dots. Stamens normally 15–20, occasionally as many as 30. Styles 2–3 mm. long. Capsule ovoid-conic, generally but little exceeding the larger sepals.

a. genuinum Rouy & Foucaud, *l. c.*, p. 344.

Icon. Reichb. Icon. 5176.

Exsicc. H. humifusum Herb. Linn.! Magnier, Fl. Sel. 2684! Kerner, Fl. Austro-Hungarica, 47!

Generally prostrate, with numerous stems 5–15 cm. long springing from the rootstock. Leaves 6–12 mm. long and 2–5 mm. broad. Sepals very unequal, entire (rarely glandular-mucronate or with a few serrulations in the latest flowers), the larger elliptical or ovate, rounded-obtuse and generally becoming foliaceous in the earliest flowers. Petals scarcely exceeding the larger sepals.

b. laxum, nov. form. Robustior et omnino major, caulibus 20–35 cm. longis, foliis 10–20 mm. longis 4–6 mm. latisque, cymis nonnunquam ramosissimis multifloris.

More robust and larger in all its parts, with stems 20–35 cm. long, and leaves 10–20 mm. long and 4–6 mm. broad. Cymes sometimes much-branched and many-flowered.

β. Liottardii DC. Prodr. i. p. 549 (1824); *H. Liottardii* Villars, Hist. Pl. Dauph. p. 504 (1789); *H. humifusum* forme *H. Liottardii* Rouy & Foucaud, *l. c.* p. 345.

Icones. Villars, *l. c.*, tab. xliv.; Reichb. Icon. 5176.

Exsicc. Magnier, Fl. Sel. 3952!

Biennial or perhaps sometimes annual. Stem suberect or erect, 4–6 cm. high, filiform, generally branched from the base upwards. Leaves 6–13 mm. long and 2–4 mm. broad, mostly rather narrow, oblong. Sepals and petals 4-merous or 5-merous, the sepals generally very unequal, entire and obtuse, but less so and fairly serrulate in some 5-merous forms; petals sometimes shorter than the larger sepals.

γ. decumbens Reichb. Icon. vi. p. 68 (1844); Rouy & Foucaud, *l. c.*, p. 344; *H. decumbens* Peterman, Fl. Lips. p. 565 (1838).

Icones. Reichb. Icon. 5176; Curtis, Fl. Lond. ii. 50 (as *H. humifusum*); Eng. Bot. 1226 (as *H. humifusum*).

Exsicc. Reverchon, Pl. d'Andalousie, 1887 (as *H. humifusum*)!

Generally decumbent, with irregularly branched rootstock, and more or less numerous stems, 10–35 cm. long, some of which often

root at the nodes. Leaves 6–20 mm. long and 4–6 mm. broad. Sepals less unequal than in *α. genuinum*, usually more dotted with black, the larger ones oblong or lanceolate, subacute or acute, and more or less serrulate-fimbriate with stalked black glands towards the apex. Petals exceeding the larger sepals.

b. eglandulosum, nov. form. Sepalis plus minusve serrulatis sine glandulis nigris petiolatis.

Sepals more or less serrulate, but without stalked black glands.

c. crassum, nov. form. Caules stricti quam in formis præcedentibus crassiores; folia marginibus paulo revolutis crassa, superiora latiora semi-amplexicaulia; sepala raro glandulis nigris petiolatis vix serrulata.

Stems strict, less slender than in the preceding forms; leaves thicker, with somewhat revolute margins, the uppermost broader and semi-amplexicaul. Sepals almost entire, but sometimes with a few stalked glands.

δ. ambiguum Gillot in Rev. Bot. x. p. 653 (1892); Rouy & Foucaud, *l. c.* p. 344.

Exsicc. Magnier, Fl. Sel. 2685!

Stems suberect or ascending from a decumbent base, more or less slender, 10–25 cm. long, from an irregularly branched rootstock. Leaves 6–15 mm. long and 2–4 mm. broad, sometimes narrower than in the preceding varieties and often with revolute margins, shortly narrowed below or semi-amplexicaul, almost without pellucid glands. Uppermost bracts sometimes sparingly glandular-ciliate. Sepals not very unequal, all lanceolate, acute, with few or many black dots and streaks, and more or less serrulate-fimbriate throughout with stalked black glands, scarcely accrescent in fruit. Petals distinctly longer than the sepals.

Hypericum humifusum, which is a plant affecting light soils and one rarely seen in any abundance, is generally distributed throughout the British Isles and has been recorded for nearly every vice-county in Great Britain. The commonest form is the Linnean type (*α. genuinum*), and of this the form *laxum* is represented in Herb. C. Bailey from East Sussex, Monmouth, Merioneth, Carnarvon, Lancashire, and Yorkshire. The variety *Liottardii*, reported from Kent and Cheshire, needs confirmation as a British plant, but var. *decumbens* is widely spread (frequently as f. *eglandulosum*), occurring, generally in moist spots, in the Channel Islands!, West Cornwall!, along the south coast to Kent, in Surrey!, Bucks, Hunts, Gloucester, Mid and North Wales, Derby, Yorkshire and the Lake District to Kirkcudbright and Bute, in Scotland. Of the peculiar form *crassum*, Mr. Bailey possesses specimens from Cape Cornwall, Borstal in Kent, Fakenham in Norfolk, and Bute.

The variety *ambiguum* grows near Land's End!, and there is an apparently identical specimen in Herb. Mus. Brit. from Hadley Wood, Herts (F. D. Parker, 1882), and another in Herb. C. Bailey from Blackheath Common, Chilworth, Surrey. The

plant collected by C. A. Johns at the Lizard is essentially similar, but approaches var. *majus* Rouy by its broader foliage.

HYPERICUM LINARIIFOLIUM Vahl, Symb. Bot. i. p. 65 (1790); *H. humifusum* subsp. *linariifolium* Rouy ap. Magn. Scrinia, p. 245 (1892); Rouy & Foucaud, *l. c.*, p. 345.

Perennial, glabrous, with more or less numerous erect or suberect, rather slender and normally unbranched flowering-stems springing from the rootstock, and frequently also prostrate filiform barren stems, with rudimentary leaves, which may root at the nodes and form new tufts. Stems terete or with two generally obscure raised lines. Leaves linear to oblong, rounded-obtuse, sessile and semi-amplexicaul, but the lower ones less so; often revolute; with black marginal dots; pellucid glands wanting. Cymes subcorymbose, often many-flowered; bracts glandular-ciliate. Flowers larger than in *H. humifusum*, generally about 15 mm. in diameter. Sepals subequal, usually lanceolate and acute, with many black dots and streaks, and margins serrulate-fimbriate with stalked black glands; scarcely accrescent in fruit. Petals bright yellow with black marginal dots, 2–3 times as long as the sepals, sometimes flushed with red on the back. Stamens about 30. Styles about 4 mm. long. Capsules ovoid-elongate, twice as long as the sepals or even longer.

α. *genuinum*. *H. humifusum* subsp. *linariifolium* α. *genuinum* Rouy & Foucaud, *l. c.*, p. 345.

Icon. Reichb. Icon. 5190*b*.

Exsicc. Magnier, Fl. Sel. 2686!

Erect or nearly so, with terete stems 20–40 cm. long or rarely still longer. Leaves linear or linear-oblong, 20–30 mm. long and 2–5 mm. broad, normally rather distant. Cymes many-flowered, sometimes rather lax.

β. *approximatum*. *H. humifusum* subsp. *linariifolium* β. *approximatum* Rouy ap. Magn. Scrin. p. 245; Rouy & Foucaud, *l. c.*, p. 346.

Icon. Eng. Bot. Suppl. 2851 (as *H. linariifolium*).

Exsicc. Mandon, Pl. Mader. 1865–66, 39 (as *H. linariifolium*)!

Suberect from a decumbent base, with slenderer stems 10–25 cm. long, generally showing 2 obscure raised lines. Leaves linear-oblong or oblong, 10–15 mm. long and 2–3 mm. broad, often strongly revolute, rather crowded. Cymes usually more contracted and with fewer flowers than in var. α.

H. linariifolium is a rare plant in Britain as on the Continent. The var. *genuinum* is found in the Dartmoor district of South Devon, and there is also a Carnarvonshire specimen in Herb. Mus. Brit. A dwarf maritime state of it has been collected by Mr. Hanbury on the cliffs near Dartmouth. The var. *approximatum* formerly grew on Cape Cornwall, and seems to have also inhabited one or two other Cornish localities, but has now almost certainly become extinct in the county. It still occurs sparingly in several places on the cliffs of the Channel Islands!

PTILOTA PLUMOSA Ag. IN BRITAIN.

By A. D. Cotton, F.L.S.

A short paper entitled "The Distribution of Certain British Algæ," published in this Journal for 1914 (pp. 35–40), has been productive of several comments with regard to *Ptilota plumosa*, and these appear to merit a brief reply and summary of results.

Though, as will be seen, I cannot regard *Ptilota* as forming part of the flora in some of the localities given by correspondents, my best thanks are due to all those who, whether by letter or printed note, have contributed data with regard to the distribution of this alga. Friendly co-operation is of special assistance when dealing with problems such as distribution.

In the paper referred to it was stated that *Ptilota plumosa* did not occur in the Irish Sea south of Anglesea, nor on the east coast of England below Yorkshire, and yet in the warmer waters of the west of Ireland it is abundant, and had been reported, though no specimen appeared to be available, from the southern coast.

The first communication which need be referred to was from Miss B. E. Duke, of University College, Cork, who informed me that she had found in the College herbarium an alga from Waterford labelled *Ptilota plumosa*, collected by Miss Ball about 1835. On careful examination she was able, however, to report that, as had been the case in previous instances, the plant was in reality *Plumaria elegans*. In a fairly representative collection of algæ made by Mr. R. Lloyd Praeger on the Saltees (Co. Wexford) in 1913, *Ptilota* was not found (see *Irish Naturalist*, 1913, p. 195). This fact, together with the repeated cases of *Plumaria* being mistaken for *Ptilota*, tended to increase the doubt with regard to the presence of the plant in the south of Ireland.

The next three notes deal with Devon and Cornwall. In this Journal for 1914 (p. 77) Miss C. E. Larter recorded a specimen found about four miles east of Ilfracombe in 1907. In response to an enquiry Miss Larter wrote that she has no recollection as to whether it was found in a growing state or amongst rejectamenta. The specimen, which she kindly forwarded, is, however, old and worn, and might well have been conveyed from a distance. In the same Journal for the following month (p. 107) Mr. J. Cosmo Mevill wrote that he was the possessor of a fine and unmistakable specimen of *Ptilota* collected near Falmouth by the late Henry Goode, and adds that with respect to Wales he had only found the plant himself at Path-y-Pistill, Holyhead. Mr. Cosmo Mevill's note elicited a reply from Mr. E. M. Holmes (*op. cit.* p. 250), who points out that Goode corresponded with, and acquired specimens from, algologists in other parts, and that the names of localities were often added from memory. He doubted if any reliance could be placed on Goode's specimen. Falmouth is a favourite spot for algologists, and its flora is well known.

Returning now to the south of Ireland, Miss Duke made a special search for *Ptilota* on the shores of Co. Cork during August,

1914, and was rewarded by being able to certify its presence in Courtmacsherry Bay. It occurred on its usual host *Laminaria Cloustoni*, stems of which bearing the epiphyte were washed ashore at several places in the bay after a gale. Miss Duke also discovered another northern alga, *Callithamnion arbuscula*, which was fairly abundant on perpendicular rocks near the Old Head of Kinsale. Both of these she has dealt with in a paper in the *Irish Naturalist* for March, 1915 (xxiv. p. 55), entitled "Some Marine Algæ of County Cork." With regard, therefore, to the boreal element, as seen in the algæ of the west of Ireland, we may reasonably conclude that it extends not only to the counties of Clare and Kerry, but also to Cork.

To sum up, the distribution of *Ptilota plumosa* still possesses the same interest. It is a markedly northern alga, but is found along the west of Ireland and round the south-west corner to near Cork Harbour. On the west coast of Great Britain there is no record of its presence as an attached plant south of Anglesea, though two odd fronds collected near Ilfracombe merit notice (see Journ. Bot. 1914, p. 39, footnote, and Miss Larter's plant, noted above). Where *Ptilota* occurs at all it is usually plentiful, and, as explained by Mr. Holmes (*op. cit.* p. 206), the presence in a well-known and well-worked locality of a single odd specimen washed ashore is always to be viewed with suspicion. The boreal element in the algæ which is present in the flora of the warm west and south-west of Ireland, and yet absent in other counties apparently suitable both in Ireland, Wales and England, is still one of the many puzzles provided by Irish botany.

OXALIS CORNICULATA Linn.

By A. J. Wilmott, B.A., F.L.S.

In 1906 Dr. B. L. Robinson contributed an article to this Journal (pp. 386–391) in which he gave reasons for changing the name of the plant usually known as *Oxalis corniculata* to *O. repens*, and for transferring the former name to the plant usually known as *O. stricta*. Since these changes are based upon an incorrect use of the Cliffortian herbarium, the matter may be regarded as of more than trivial importance.

The original account of *Oxalis corniculata* in Linnæus's *Species Plantarum*, p. 435 (1753), is as follows:—

"11. Oxalis [*corniculata*] caule ramoso diffuso, pedunculis umbelliferis. *Hort. cliff.* 175. *Hort. ups.* 116. *Roy. lugdb.* 458. *Sauv. monsp.* 173. *Gort. gelr.* 91.
Oxys flavo flore. *Clus. hist.* 2, p. 249.
Trifolium acetosum corniculatum *Bauh. pin.* 330, luteum minus repens etjam procumbens *Moris. hist.* 2, p. 183, s. 2, t. 17, f. 2.
Habitat in Italia, Sicilia. ⊙.
Confer. Oxalis lutea annua, floribus dentatis. *Few. per.* 3, p. 49, t. 24."

The first and diagnostic reference to the *Hortus Cliffortianus*, p. 175 (1737), reads thus :—

" 4. Oxalis caule ramoso, pedunculis multifloris.
Oxys flavo flore. *Clus. hist.* 2, p. 249.
Oxys lutea. *Bauh. hist.* 2, p. 388. *Boerh. lugdb.* 1, p. 319.
Oxys lutea corniculata repens. *Lob. hist.* 495. *Dalech. hist.* 1355.
Oxys. *Cæsalp. syst.* 564.
Acetosella flore luteo, capsula corniculata. *Rupp. jen.* 102.
Trifolium acetosum corniculatum. *Bauh. pin.* 330.
Trifolium acetosum corniculatum minus repens & etiam procumbens. *Moris. hist.* 2, p. 183, s. 2, t. 17, f. 2.
Crescit in locis umbrosis Italiæ, Siciliæ, *circa* Hispalim & *in* Madera.
Oxys idem est ac acidus, quod pro nomine plantarum satis late petitum, licet a Plinio habeatur, ergo substituo aliud Plinianum Oxalis, ab eadem metaphora dictum."

A study of these references makes it evident that all the authors cited are dealing with the same plant, all basing their work on that of Clusius, Lobel, the two Bauhins and Morison. Dr. Robinson (*op. cit.* 388) himself allows that "it is . . . . evident, from an examination of the figures of Clusius, Lobelius, and Morison, that they had before them the creeping prostrate-stemmed plant . . . ." which had always been called *O. corniculata*. The plant in Morison's herbarium is stated by Vines and Druce (*Account of Morisonian Herbarium*, p. 13) to be the same species. With regard to the other fundamental references, J. Bauhin's figure is a very good one of the same species, and Casimier De Candolle (Bull. Herb. Boiss. 1904 ; 735) states that the plant representing *Trifolium acetosum corniculatum* in Caspar Bauhin's own herbarium is also *O. corniculata*.

It is thus quite clear that in the *Species Plantarum* Linnæus has merely given the binominal name *O. corniculata* to the "creeping prostrate-stemmed plant," so well set forth by the authors whose works are cited. Dr. Robinson considers that the word "multifloris," occurring in the diagnosis, shows that Linnæus had in mind the plant with umbellate inflorescence. It is more probable that the word is used in mere contradistinction to the *uniflorous* character of the other common *Oxalis*, viz. *O. acetosella*.

Dr. Robinson's case for using the name otherwise is based on the fact that "there is still preserved at the British Museum a specimen of the plant from the *Hortus Cliffortianus*, which exhibits the several-flowered (in the young state umbelliform) inflorescence of our species no. 2 [*O. stricta* auct.], with which, in all other respects also, this specimen is in entire agreement." He states that "It is thus evident that both of the Linnæan species [*O. corniculata* and *O. stricta*] were composite," and proceeds to show that according to both the principle of priority of position and that of residues the name *O. corniculata* must be

applied to his "species no. 2." We think a single specimen is poor evidence that Linnæus did confuse two plants under his *O. corniculata*, and especially poor evidence when it is noted that the specimen in question is labelled "Oxys sive Trifolium acetosum corniculatum luteum, minus repens & etiam procumbens M. H. 2, 184," *i.e.* replacing Morison's name by its more modern equivalents, *O. corniculata* auct. = *O. repens* Thunb. etiam Robinson.

In any case, it is incorrect to state that "According to the principle of priority of position *O. corniculata* L. must rest upon the plant of the *Hortus Cliffortianus*." The International Rules state very definitely that only *published* matter counts in nomenclature, although it is evident that in particular cases authentic or type specimens are invaluable for elucidating and supplementing the published matter. In this case the published matter is quite definite: *Oxalis caule ramoso, pedunculis multifloris*, Hort. Cliff., is the "creeping prostrate-stemmed plant," and not only is the Herb. Cliffort specimen referred to no "type," but it is merely a misidentified specimen. On the other hand, there are cases in which a plant is described for the first time in the *Hortus Cliffortianus*, the corresponding specimens in Cliffort's herbarium being correctly regarded as types.

But in cases where the names in the *Hortus Cliffortianus* refer to a composite collection of references to various authors, none of the specimens can be regarded as types, and it is the references alone which matter. Mr. Lacaita, in this Journal (1912, p. 223–4), has already pointed out that Linnæus probably never again saw Cliffort's herbarium after he finished the *Hortus Cliffortianus*. Even if the International Rules were not so definite as they are, one would be compelled to regard the references from the *Species Plantarum* to the *Hortus Cliffortianus* as merely references to the published matter of the book. In those cases in which the names refer to a list of references, the herbarium is sometimes as composite as the book—there being several specimens representing the species under various of the names cited, and sometimes even under names which do not appear in book. This is the case with this *Oxalis*, since besides the specimen referred to above there is another labelled "Oxys Lutea J. B. 2. 388." This is a characteristic specimen of *O. corniculata* L. et auct., showing how impossible it is to regard any such specimens as types. The conclusion arrived at would depend upon which specimen was seen, and might be changed if one specimen were ever lost or missing, or not collected from the garden to be placed in the herbarium.

There is therefore no reason for the changes in nomenclature proposed by Dr. Robinson, since the principle of residues cannot be applied to the case of *O. corniculata* L., which is not composite. In conclusion, I desire to insist on the necessity of being very careful before using any of these old specimens to decide (especially in the face of other evidence) what species must bear the names given in the *Species Plantarum*.

JOHN SCAMPTON (fl. 1696).

By James Britten, F.L.S.

In this Journal for 1909 (pp. 99–103), under the heading "A Seventeenth Century English Botanist" I gave some account of the Rev. Matthew Dodsworth (fl. 1660–90), whose plants are in the Sloane Herbarium (H. S. 27) and from whom letters are included in the Sloane MSS. My work upon the Sloane Herbarium Catalogue has incidentally led to a considerable acquaintance with others of about the same period whose knowledge of British plants was considerable, but of whom little beyond their names is known. I have thought that this information, derived as it is mostly from inedited sources, might be of sufficient interest for publication in this Journal, in which I therefore propose from time to time to place it on record.

To the subject of the present notice we are indebted for the addition of *Calamagrostis lanceolata* Roth to the British Flora. The first record of this is given by Petiver in his *Concordia Graminum*, &c. (1716) p. 3, as follows:—

"69 Small *Rheed* (sic) *Grass*. Calamagrostis *minor* glumis russis & viridibus. Qr? Gramen *Arund.* panicula molli spadicea minus CB 7. 4. Its *Panicles* some green, others brown and yellowish, are smaller and more loose than the *Wood Rheed*. The first discovery of this Grass is owing to Mr. John Scampton a Curious Botanist, who sent it me from *Leicestershire*."

Of this there are excellent specimens in Herb. Sloane 329, f. 36, to which this printed account is attached with a further ticket in Petiver's hand:—"Gr. arundinaceum locustis aureis nob. This I found very plentifully all along y^e^ side of a moat neer Huntingdon; it grew 3 or 4 feet high but most of it lay in y^e^ ground; it rises so tall and y^e^ stalke so weake, it could not stand upright (Scampt. see his letter Jan. 22, 169$\frac{5}{6}$)." Another specimen of the plant is in Buddle's herbarium (H. S. 125, f. 11) labelled "Gramina tomentosa a D. Scampton in agro Northampt. circa Oundle collecta." Unfortunately it is impossible to carry out Petiver's direction to "see" Scampton's letter, for although copies of Petiver's replies to Scampton are in Sloane MSS. 3332–3, nothing from the latter seems to have been preserved. It is evident from the replies that Scampton was a competent botanist and much interested in the flora of his neighbourhood. Petiver's earliest letter to him (3332, f. 63 back), in which he acknowledges "yours from Huntingdon," is not dated—it was probably written in 1695: it includes lists of plants as to which Scampton had consulted him, with interesting critical notes, and asks that further specimens of numerous species might be sent to him. Petiver mentions especially a grass which "seems different from y^e^ gr. Arundinaceum Raii Syn. 185: pray send me more of it in its several states"; it was probably in answer to this that the excellent examples now in Herb. Sloane were sent, with the letter from which an extract has already been given. Petiver urges

Scampton to collect all the grasses he can find, "among which tribe I doubt not but you may make some discoveries." Another list of plants sent by Scampton, undated but probably of this period, with letters partly undecipherable, is in 3340 ff. 204 *sqq*. Petiver urged Scampton to continue to send plants, for which a "retalliation" in kind—to "retalliate" in this sense was a common expression with Petiver—is promised. Most of the letters however are concerned with insects, chiefly butterflies and beetles, with which Scampton seems to have been well acquainted: he also paid some attention to shells.

Although there is no positive evidence that Scampton lived at Huntingdon, for Petiver unfortunately did not note the addresses of his correspondents on the copies of his letters to them, the plants sent for the most part are those of the Midlands. He also botanized "amongst the Peak-Moors in Derbyshire," whence Petiver, who styles him an "ingenious botanist," records a moss of his finding hitherto undescribed (Mus. Pet. n. 74)—apparently *Grimmia aquatica*; as well as further north, for Petiver refers to a specimen of *Saxifraga stellaris* which he had sent. Among his contemporaries Scampton was friendly with William Vernon, at whose house at Cambridge Petiver hoped to have met him in 1696. One or two of the letters are addressed to "Dr." Scampton, but this I think was accidental. Although none are of later date than 1698, he was probably alive when the *Concordia* was published in 1716.

SHORT NOTES.

ORCHIS PRÆTERMISSA Druce.—In the Proceedings of the Ashmolean Natural History Society of Oxfordshire for 1914 (pp. 30–33) Mr. Druce figures and describes under this name an orchis allied to *O. latifolia* and *O. incarnata* but considered by him distinct from both. Of this Latin and English descriptions are given, the latter of which is here transcribed:—"Root two palmate tubers, with long stout rootlets. Stem hollow, 6–18 inches. Leaves normally linear-lanc., narrowing from a broad base to the hooded apex, usually gradually, sometimes unequally, and sometimes somewhat broader in the middle; yellowish green, green or greyish or darker green, unspotted erect or ascending. Bracts often coloured, as long as or longer than flowers. Flowers conspicuous, of various shades of rose-purple, reddish, or dark crimson purple, in a more or less lax cylindric or conical spike. Lip broad (as broad as long), flat, more or less distinctly three lobed, the central lobe smaller, and slightly longer, as long or slightly shorter than the lateral lobe, the sides not reflexed, marked with spots, lines, or blotches of a darker colour, or more rarely in a geometric pattern with defined margins. Viewed from in front the flowers look broad and showy. Upon petals converging into a hood. Upper sepals usually somewhat paler, divaricate. Spur shorter than ovary, curved, cylindric. Flowering usually 10–14 days later than *incarnata*."

Surrey Plants.—A slender plane-leaved form of *Reseda lutea* from Worm's Heath seems to be the var. *pulchella* J. Müll. It agrees fairly well with the figure of *R. gracilis* (= var. *pulchella*) in Reichenbach's *Icones*. *Silene dubia*, scarce or extinct elsewhere in the county, has existed for some years past on a gravelly bank near the Thames at Kingston. In this Journal (1910, p. 164) Mr. F. N. Williams has mentioned the occurrence of a straw-coloured form of *Lathræa Squamaria* at Harefield, Middlesex. A similar very pretty form that would best be described as cream-coloured has recently been seen near Woldingham, where it appears year after year, unaccompanied by the normal coloured plant. Another colour variation, *Lamium purpureum* with white flowers, grows at Effingham, and seems quite a constant departure from the typical plant, as, in my garden, this form has reproduced itself for some years now, and maintains its pure white flowers. An *Orchis*, growing at Ockham, has been accepted by Mr. Druce as his *O. prætermissa*. It grows in company with *O. latifolia*, and I can only differentiate it from this latter by the unspotted hooded leaves. In the same neighbourhood grows what is, I believe, Mr. Druce's conception of the Linnean *O. incarnata*. The Marsh Orchis of Wimbledon Common that has received from different experts the names of *incarnata* and *latifolia* is *Orchis prætermissa*. *Calla palustris* in recent years has flourished exceedingly at its locality at Wisley, and in 1914 was quite a feature of the aquatic vegetation there, flowering profusely in July.—C. E. Britton.

Melampyrum pratense L. var. purpureum C. J. Hartm.—The first description of this occurs in Hartman's Svensk och Norsk excurs.-fl. 1846, p. 86—*β purpureum*, corolla dark red with lip flame-coloured; in the second edition (1853), p. 86, its description is:—Corolla dark red with lip internally yellow. In the same author's Handbok Skand. Fl. ed. 11, 1879, p. 121, the same diagnosis is found, except that the word "lower" is added before "lip." As far as Britain is concerned, this beautifully coloured Cow-wheat seems decidedly rare. The first reported station was the Outer Hebrides, where Mr. W. S. Duncan found it at Ullaval, N. Harris, at an elevation of 1000 ft., in 1896, and sent specimens to Mr. A. Bennett, who recorded it in Ann. Scot. Nat. Hist. 1905, p. 170. Messrs. J. A. Wheldon and A. Wilson gathered what was evidently the same plant in Glen Eunach, at 2400 ft., and Glen Feshie, at 2200 ft., in Easterness (v.-c. 96), in 1909. (Bot. Ex. Club Report, 1909, p. 467.) In July, 1913, when staying at Fortingal, Perthshire, Mr. D. A. Haggart handed me two or three examples of this striking plant which he had gathered a short time previously on Schiehallion, in the same county, where it grew, he told me, in plenty on the north side at an elevation of about 2900 ft. The most striking feature of this plant is, of course, the coloured corolla which Messrs. Wheldon and Wilson describe as "tipped with a rich purple or magenta," or, as Mr. Haggart described it, "yellow with purple lips." The Rev. E. S. Marshall remarks (Bot. Ex. Club Report, *l.c.*) that this

neat compact plant comes under var. *montanum* (Johnst.) as a colour form, and, with Mr. Haggart's specimens before me, this seems a most reasonable view. As noted before in this Journal (1914, p. 140), I consider, however, that Johnston's *montanum* is really only a *part* of Oliver's *ericetorum*, and is connected to it by numberless intermediate states.—C. E. Salmon.

John Wilkins.—Among some notes which have accumulated for the new edition of the *Biographical Index of British and Irish Botanists* (now, I am glad to say, approaching completion), I find one from the late Otto Kuntze which reached me in 1898. I did not print it, in the hope that I might ascertain something more about its subject, but I have not done so, and now put it on record on the chance that some one may be able to supply such information. Kuntze's letter, which I print *verbatim et literatim*, was accompanied by an advertisement of the collection and an enumeration of its contents, the heading of which is as follows:—

"Iconum Botanicarum Thesaurus (cong. a John Wilkins).
Sammlung von ca. 35,400 Abbildungen von Phanerogamen, theils den besten und kostbarsten Abbildungswerken entnommen, theils in Handzeichnungen (über 4950 Handzeichnungen, ca. 30,400 Abbildungen aus Werken), vereinigt in 137 gross-folio Bänden."

The letter runs:—

"Villa Girola San Remo, Italia
5/10/98

"Dear Mr. Britten!

"I see from your last number of J. of bot. that you continue your Bibliographical Index of British botanists. May you enclose the following note as far as you like and complete it:

"Wilkins, John (18 . . – ± 1875) b. . . . . , d. in Dresden, Saxony and made there the greatest systematical collection of Icones plantarum with very good indices (4 vol. folio ± 2400 pages in 4 columns, that proved him to have been a very learned botanist, but he did not publish anything. Otto Kuntze possesses now therefrom the Phanerogamæ (137 volumes in gr.-folio), Cryptogamæ vasculares (1 vol.) and Algæ (5 vol.), the Musci and Fungi being in other hands. That collection of Phanerogams being now in San Remo was for 10 years lent to the Berlin botanic Museum and contains 35400 icones with 4950 hand-made drawings, most of them nicely coloured after living plants; moreover about ± 5000 tabulæ inserendæ. So it is now the second greatest collection of this kind in the world, only that in Kew being larger, but it may be the most valuable existing, therein being enclosed the tables cut out of many very rare older works, that are no more to be bought even from second hand.

"That collection was sold after the dead of John Wilkins to the bookseller Loeser Wolff in Dresden then to Friedlaender & Sons in Berlin and to myself. That is all I can say from that English botanist; perhaps you can find more dates about him with the help of your J. of bot.—Yours faithfully Otto Kuntze."

James Britten.

VACCINIUM ULIGINOSUM var. PUBESCENS (p. 90).—On looking up the specimens, I find that some of the leaves of my Argyll plant, identified as this by Mr. Blake, are minutely hairy on the leaves beneath. They were gathered at 2000 ft. This peculiarity is more marked in two pieces collected on Lochnagar (probably well above 3000 ft.), July 17th, 1886. All my other Scottish examples appear to have quite glabrous foliage. As far as Britain is concerned, I am inclined to suppose that the pubescence (not a very good varietal character in itself) is only a *state*, coeval with the flowers; in more northern regions it may be permanent.—EDWARD S. MARSHALL.

THE WILLOW-GALL (p. 97).—Another locality in the Metropolitan area where this curious growth can be seen is at Wimbledon, where, last summer, I had the opportunity of examining this gall, which infests some trees of *Salix fragilis* growing in a garden in the centre of the town. Travellers by the South-Western Railway have the opportunity of viewing an abundance of these galls, as most of the willows (*Salix fragilis*) growing on the Wimbledon Sewage Farm, bordering the railway between Earlsfield and Wimbledon, are loaded with them; during the winter and spring months they have been very conspicuous objects.—C. E. BRITTON.

RICHARD KENTISH (p. 137).—We are indebted to Mr. W. Roberts for directing our attention to various references which enable us to supplement the information lately published regarding this man. Munk (*Roll of Royal College of Physicians*, ii. 358 (1861)) states that he "was born in Yorkshire and educated in Edinburgh, where he took the degree of Doctor of Medicine 24th June 1784. He was admitted a Licentiate of the College of Physicians 30th September 1790." This last distinction was not obtained without difficulty, as is shown by the following notice in the *Catalogue of Five Hundred Celebrated Authors of Great Britain*, published two years earlier (1788):—

"KENTISH, RICHARD, M.D. He has lately excited a considerable degree of attention by the mortification he experienced in being rejected by the college of physicians in London, and a consequent challenge sent by him to one of the members of that body, who was principally concerned in his examination. Doctor Kentish seems to have been seized, in consequence of this adventure, with a desire of convincing the world of that proficiency, made by him in the science of medicine, of which he was unable to convince the gentlemen in Warwick-lane." A list of his papers follows: the offices of the College were at that period in Warwick Lane. His death is recorded in Gent. Mag. 1792, 388; "April 5. At Bridlington, co. York, Richard Kentish, M.D., in his 62d year."

WHO WAS DR. BONHAM?—My conjecture (pp. 67–8, *supra*) that "Bonham" on the title-page of Parkinson's *Theatrum* might be a misprint for Bauhin falls to the ground. In the first place, Parkinson generally quotes the Bauhins as "Bauhinus."

Secondly, on p. 745, writing of "Acetosa-Cambro-britannica montana" (*Oxyria digyna* Hill), he says:—"The Gentleman of Anglesey called Mr. Morris Lloid of Prislierworth . . . showed it to Dr. Bonham in his life." A thorough search through Parkinson would very probably yield other references to this Dr. Bonham, who was, no doubt, the one mentioned in my previous note. I may add that the collapse of the conjecture I then threw out in no way affects my conviction as to Parkinson's indebtedness to Lobel.—G. S. Boulger.

REVIEWS.

Studies on the Vegetation of Cyprus based upon Researches during the Spring and Summer 1905. By Jens Holmboe. 4to, pp. 344; 7 plates, 137 text-figs. Bergens Museums Skrifter, Ny Raekke, Bind 1, No. 2. Bergen: John Griegs. 1914.

As was expected, light has been thrown upon many Cyprian plants by the publication of Mr. Jens Holmboe's beautiful quarto volume recently issued by the Trustees of the Bergens Museum, of which he is Director. This well-printed book, with its very numerous and excellent illustrations, is an important addition to the literature of the Mediterranean region; and naturally is a great advance on Unger and Kotschy's *Die Insel Cypern* published in 1865. The volume starts with an interesting sketch of the physical features of the island—its topography, geology, and climate. The second chapter is entitled Historical Development of our Knowledge on the Cyprian Flora, and comprises a list of the Cyprian plants, both wild and cultivated, mentioned by authors before 1787, the year of Sibthorp's visit. This list, as the author remarks, shows how extremely poor was our knowledge of Cyprian vegetation little more than a century ago. Even Sibthorp noticed only 313 species from Cyprus in his *Flora Græca* (1806–1840) and in the *Floræ Græcæ Prodromus* (1806–13) compiled with Sir J. E. Smith. Unger and Kotschy enumerated about 900 flowering plants and ferns, besides some 150 cultivated and doubtful species, in 1865; and in 1906 my own estimate was 1170. Unfortunately, I fail to find any mention of Holmboe's total, possibly because of difference in opinion as to what constitutes a species, and the frequent modern application of the term subspecies. A rough calculation, however, gives to-day 1400 species and subspecies of native vascular plants.

In 1907 my estimate of endemic species * was put at 55. Holmboe now gives 69 endemic species of phanerogams, 14 subspecies ("several of which many would reckon as good species") and 6 varieties. Cyprus appears to have a rather larger number of endemic plants than other islands in the Mediterranean.

Mr. Holmboe's work is largely based upon his own observations and collections made in the island during the spring and

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* Hutchinson and Cobham, *A Handbook of Cyprus*, 5th issue (1907).

summer of 1905, when he visited Cyprus with a grant from the University of Christiania. He stayed in the island from March 3rd to October 1st. Nearly two hundred pages are devoted to a list of the spontaneous vascular plants hitherto observed in Cyprus. The families and genera are, with few exceptions, arranged according to the system of Engler and Prantl; and the citations under each name are full and adequate. The half-tone and other illustrations are excellent, and none are too reduced in size to be of real value. It is unfortunate there is no list of them.

About a dozen new species and several new subspecies and varieties are described and mostly figured. Among them are the following interesting plants:—*Allium Willeanum*, *Ornithogalum chionophilum*, *Hyacinthus Picridis*, *Crocus Hartmanianus* (Cyprus is noted for its remarkable monocotyledonous endemic species), *Arenaria cypria*, *Umbilicus cyprius*, *U. pallidiflorus*, *Euphorbia Thompsonii*, *Hypericum millepunctatum*, *Nepeta Troodi*, *Galium Laurae*, *Pterocephalus obtusifolius*, and *Onopordon insigne*. Several of Post's new plants are also figured, as are some of Boissier's species. Among ferns, the author has found on "red-earth," near the monastery of Hagia Napa, large masses of *Ophioglossum lusitanicum*, which is very rare in the district of the *Flora Orientalis*. The easternmost localities hitherto known are in the Peloponnesus.

There is a short chapter on the fossil quaternary flora of Cyprus, and an extensive and very interesting one on the plant-societies of the island. This chapter, illustrated with numerous photographic pictures of vegetation and of remarkable plants, adds greatly to the value and general interest of the book: it is almost exclusively the result of Mr. Holmboe's own observations. Among these pictures is a remarkable one of *Cistanche* (*Orobanche*) *tinctoria*, parasitical on the roots of *Atriplex Halimus*. At least twenty-six pages are given to an account of the forest-societies alone, with good views from photographs. Important as is the question of the Cyprus forests and their upkeep, space precludes any comment, except to say that the former neglect by the Turks is a thing of the past. The ravages due to unrestricted pasturing of goats had become so serious a matter that, in 1912, a Bill was submitted to provide for the gradual exclusion of goats from the island. It is thought that *Anagyris fœtida* is the only shrub the goats will not touch. There are some suggestive remarks in the ninth chapter upon the spreading of some Cyprian plants, and the author points out how little information we yet have upon "the spreading-biology of the Mediterranean flora." The last chapter, of extreme interest to students of geographical botany, is a brief survey of the affinities and history of the Cyprian flora.

One never likes to criticise the English of a foreigner who is good enough to publish a work in our language. Yet, although misprints are very few, there are various words and expressions used which might have been improved had an Englishman read the proofs. There is also a very excusable Latinising of certain

terms of which there is an ordinary English equivalent, *e.g.* "specimina" for specimens, "habitus" for habit. Mr. Holmboe writes English so well, that one wishes that his admirable work had been perfect in this respect.

The following notes are the most important of those which bear upon the plants included in my paper on Cyprus plants which was published in this Journal for 1906, but Mr. Holmboe's careful work naturally comprises many interesting observations on other species. I take this opportunity of pointing out that my paper, which the Editor headed 'The Flora of Cyprus,' was primarily a list, with localities, of some 550 Cyprian phanerogams, and a few others, which Boissier had not recorded from the island in his *Flora Orientalis*. This explanation is given in my introduction, but is not evident at a glance. The paper was based chiefly upon a collection of about 300 plants presented to Kew by Mr. A. G. and Miss M. E. Lascelles, and a smaller one made by the late Miss E. A. Samson, which were named by me in 1904. It was my intention to continue investigations on the flora of Cyprus, and eventually to publish a complete list of the flowering plants and ferns of the island; but this was stopped on hearing of Mr. Holmboe's visit to Cyprus in 1905 and of his forthcoming (the present) publication. The author gives ample credit for my previous investigations, and he is quite in accord with the conclusions I came to on the subject of *Phlomis lunaraefolia*, and a new *Phlomis* (*P. grandiflora*) which I described in *Annals of Botany*, July, 1905. He also agrees in placing John Ball's *Juncus pygmaeus* from Cyprus under *J. bufonius* (see Journ. Bot. 1905, 332), having examined with me Ball's specimen in the Boissier Herbarium after I had seen that at Kew.

Two of the new species, both endemic, viz. *Nepeta Troodi* and *Euphorbia Thompsonii* were in my list under other names. Holmboe says that probably Post's *Nepeta orientalis* and a plant collected by Lascelles on Troodos, which I placed under *N. Sibthorpii*, are his *N. Troodi*. The new *Euphorbia* is nearest to *E. Sibthorpii* Boiss.; it includes a plant collected at Pissuri by Miss Lascelles, which I placed with *E. Characias*. Sibthorp identified the new species with *E. silvatica* Jacq., and Kotschy with *E. Kotschyana* Boiss. Holmboe remarks: "I have only seen *E. Thompsonii* at a single locality, *viz.* on dry slopes between maquis-shrubs near the village of Pissuri, evidently the same place where Lascelles has also collected it . . . . it was only after examination of Kotschy's materials from the pine-forest of Prodromo (U. K. 899 in Herb. Imper. Vindob.) that I arrived at a definite conclusion regarding the nature of this plant. Probably endemical in Cyprus."

Euphorbia lanata Sieber (1826) near Kophino (Lascelles), Larnaka (Sintenis 894!): an earlier name is *E. malacophylla* Clarke, *Travels* (1817).

Aristolochia sempervirens L. (*teste* Kotschy), only known from Crete, is probably *A. altissima* Desf.

Nigella stellaris Boiss. Anadhyron? (Lascelles). "As this

species is else quite unknown in Cyprus, the specimens determined thus may be suspected to belong to *N. fumariaefolia* Kotschy," which is common in the lower regions.

Sedum palestinum Boiss. Pentedactylos (Lascelles). "This is a species closely allied to *S. pallidum* M. B., and hitherto only known from the mountains of Syria and Palestine." It is doubted by Holmboe for Cyprus.

Heliotropium undulatum Vahl. "Common everywhere" (Lascelles). Not collected by others, and may be *H. villosum* Willd.

Onosma frutescens Lam. Hagios Hilarion (Lascelles). Is probably *O. caespitosum* Kotschy, which grows there abundantly, and is endemic.

Odontites lutea L. Cyprus (Lascelles). Is possibly the endemic *O. cypria* Boiss. Here, also, should be placed *O. frutescens* Poech., Enum. Plant. Cyp. (1842) and *O. Bocconi* Kotschy, Cypern (1865).

Anthemis montana var. *tenuiloba* Boiss. Cyprus (Sibthorp). Is *A. complanata* Halacsy.

Carlina curetum Heldr. Between Platraes and Pera-Pedia (Lascelles), is *C. involucrata* Poir., a subspecies of *C. corymbosa* L.

C. lanata var. *pygmaea* Post is described as a new species, *C. pygmaea* (Post) Holmboe, especially distinguished by the scales of the involucre.

Onopordon Sibthorpianum Boiss. et Heldr. (Sintenis, No. 545) is the subspecies *O. anatolicum* Boiss. et Heldr.

Crupina vulgaris Cass., of Kotschy, is *C. Crupinastrum* Vis.

Centaurea Behen L., of Sibthorp, is probably *Serratula cerinthefolia* Boiss. Fl. Orient. iii. 585 (1875). "The combination *Serratula cerinthefolia* does not occur earlier, although Sibthorp and Smith both there and in *Index Kewensis* are erroneously quoted as authors."

Cichorium Intybus L., of Kotschy, is *C. pumilum* Jacq.

Arnoseris pusilla Gaertn. Woods near Prodromo (Kotschy, 814), is *Hyoseris glabra* subspecies *H. minima* Cyrill.

H. Stuart Thompson.

O. Stapf: *The Southern Element in the British Flora.* Reprinted from A. Engler's *Botanische Jahrbücher*, Band 50, pp. 509 to 525. Leipzig & Berlin: W. Engelmann. 1914.

This is a very able and carefully worked out account of the "Atlantic" and "Mediterranean" elements of British and Irish vegetation; together with a sketch of the views as to their origin held by Forbes, Engler, Mr. Clement Reid, Dr. Scharff, and the author.

Field-botanists may well hesitate, in face of the fairly numerous endemic species found in our islands, and of several others which occur quite locally, at a great distance from any Continental station, before fully accepting Mr. Reid's theory that "no temperate flora could have survived the conditions prevailing in the islands during

the Glacial period; that the existing flora, apart from a few Arctic and Alpine species, came in towards the end of, and after, that period; and that especially the 'Atlantic or Lusitanian' (also referred to as 'Pyrenean') and the 'American' and 'limestone' elements arrived, and may be still arrive, by chance introduction of seeds, now mainly due to birds driven by exceptional gales" (p. 509). It has been pointed out that birds usually migrate fasting; and, although ducks, &c., doubtless convey some seeds by mud adhering to their feet, this is unlikely to happen in cases of prolonged flight. On the whole, it may fairly be argued that no sweeping generalisation can account for all the facts.

Our southern plants are dealt with under three heads:—1. Species (13) found on and near cultivated land; these include our eight *Fumariæ*, some of which Dr. Stapf (I believe, rightly) thinks may possibly be native, and *Antirrhinum majus*, which has little or no claim to this rank. 2. Species (48) confined to the coasts (littoral species). *Tamarix anglica* is most likely introduced, even in Cornwall. 3. Species (95) neither littoral nor confined to the neighbourhood of cultivated land. Of these *Conopodium*, *Carduus pycnocephalus* (i.e. *crispus*, auct. angl.), *Erica cinerea*, *E. Tetralix*, *Scilla non-scripta*, and *S. verna*, can hardly be called southern plants. Notable omissions are *Trifolium strictum*, *Leucojum æstivum* (truly wild!), and *L. vernum*; the status of the last-named is, however, open to question.

The second and third groups have ten columns annexed, giving their northern limit on the Continent; West, South, and East limit, in Great Britain, and West and East in Ireland; character of habitat; vice-counties or (Irish) divisions; and type, according to Watson.

A useful Summary concludes this excellent paper. It deserves more thorough analysis than is possible within the compass of a short notice.

EDWARD S. MARSHALL.

Fundamentals of Plant Breeding. By JOHN M. COULTER, Ph.D. D. Appleton & Co. 1914. 6*s*. net.

THE critic who sets out to review this book finds himself confronted with a very difficult task. He cannot fail to be attracted by the direct and clear style in which it is written; nor can he fail to recognise the sound and wide knowledge of botany which distinguishes the author. Nevertheless, if the critic happens to be conversant with the practical side of horticulture or agriculture, he is driven to the conclusion that this work—despite its easy style and considerable body of information—is by no means free from the imperfections which characterise so many of the books which seek to popularise the science of genetics.

These defects, common to this class of book, appear to be of two kinds, and are traceable to the fact that the books are written by botanists who have been moved by the rapid current of genetical discovery to write upon the subject. Of these defects the first lies in the failure to recognise or propound precisely wherein the

methods of genetical research are of immediate service to the practical plant-breeder, and in advancing claims for those methods which experience can scarcely justify.

As a consequence, the men engaged in the work of plant improvement fail to find these books of much practical service, and prefer to continue to work on the old lines which, though defective, have led to wonderful results. The rule of thumb method of the practical breeder has transformed Nature. The teacher of genetics undertakes to show that man how the work may be done with greater despatch and completeness. Yet the teacher is unable, as a general rule and in the present state of knowledge, to do more than indicate useful precautions and time-saving procedures. Consider, for example, the genetical problem involved in the sorting out or production of the three or four races—early, mid-season, and late—of the culinary pea. The practical man produced these pure breeding races long ago; the geneticist is not able at the present moment to lay down precise rules, obedience to which would lead to the result already achieved.

Thus it is that, although the general reader will find Prof. Coulter's book interesting, the practical man must still await the guidance that he needs.

The second defect which this book shares with others of its kind is the neglect to state precisely what it claims to show. As an example, we may choose the chapter on How to Secure Drought-resistance. The writer points out that drought-resistant forms must first be discovered and "pedigreed for inheritance." He observes that this property must next be combined with quality. He avers that the drought-resistant race may be brought up to the standand of quality by continuous selection, admitting that it may be a slow process; but, for our part, we know of no recorded case in which selection has done this work. As an alternative, he suggests the usual method of crossing the resistant race with one of desired quality, in order to secure the combination in a hybrid. As to the method to be followed, all that is vouchsafed is the following statement which, by its reticence, is frankly useless:—"It will be remembered that the desired combination will not occur in all the progeny; but if enough hybrids are produced, the desired combination will be found . . . . if drought-resistance and quality behave as unit characters, only half of the progeny of the hybrids would continue the desired combination."

Even though we assume that drought-resistance (D) and quality (Q) are unit characters, the statement is incorrect, for in that case we have by crossing D q and d Q:—F_1 = D d Q q, and in F_2 we shall have in sixteen offspring nine with the desired combination; but of the nine only one is pure for these characters. If, moreover, as is most probable, one or other "character" is a recessive, or if it depend not on a single factor but on several—and quality may well depend on many—the problem becomes far more complicated than would appear

from the sentence we have quoted. It may be claimed on behalf of the author that his aim is to appeal to the general reader rather than to the working plant-breeder. Yet, although this be admitted, the criticisms remain valid, for "science is measurement," and if the measures meted out are inaccurate or vague, the volume which publishes them does not fulfil the conditions required of a work of science.

F. K.

The Potamogetons (Pond Weeds) of the British Isles, with Descriptions of all the Species, Varieties, and Hybrids. By ALFRED FRYER, A.L.S., and ARTHUR BENNETT, A.L.S. (The *Lucens* Group edited from Mr. Fryer's Manuscript Notes by A. H. EVANS, F.Z.S.) Illustrated by Robert Morgan, F.L.S., and others. London: L. Reeve & Co. 1915. Quarto, pp. x, 94; 60 plates. Price £5 5*s.*, coloured; £3 15*s.*, uncoloured.

THE completion of this fine book (the most important and profusely illustrated complete monograph on any large critical genus of our country hitherto published) will be very welcome to those who can afford its cost. The co-operation of Messrs. Bennett and Fryer, whose combined knowledge was unrivalled, with a draughtsman so enthusiastic and talented as the late Robert Morgan, has been invaluable; it is unfortunate that neither the original author nor the artist lived to complete their task, though Mr. Evans was able to compile the section dealing with the *Lucens* group from Fryer's notes and personal information, so as to represent his final ideas; and little or nothing has been lost through Mr. Bennett's having to undertake the grass-leaved group, in the knowledge of which he is *facile princeps*, and in which, as he says, his colleague had not taken quite the same keen interest as in the others.

Seventeen years have passed since Mr. Britten wrote a notice of the first part issued (Journ. Bot. 1898, 354); and his criticism is very just. The one serious drawback to which attention was then called—that the plates bore no names—was probably irremediable; but it would have been a good thing if a complete account of the distribution of each species in Britain had been given as an appendix, in accordance with his suggestion.

All the plates are good, though the superexcellence of Morgan's drawings makes the last twelve, by other hands, look relatively poor; the twisted foliage of tab. 53 (*P. Friesii*) seems unnatural. *P. vaginatus* was drawn from Swedish specimens, as fresh material from Shetland could not be obtained. There is a reduced figure (in the text) of *P. pennsylvanicus*, naturalized in a canal near Halifax; "I believe this to be the only instance of the introduction of a Potamogeton" (Ar. B.). In some cases more than one illustration of a species is given; for instance, we have three representations of *P alpinus*, and its fruit is portrayed on tab. 26 (*P. prælongus*).

Mr. Bennett has written a four-page introduction, dealing mainly with the genus as a whole. He mentions that Dr. Graebner,

in the *Pflanzenreich* (1907), admits eighty-seven species and about forty-seven hybrids, besides factors of lower rank, as existing in the world; in addition to one species omitted by him, about eleven species and eighteen subspecies or hybrids have since been described. Forty-two species are limited to one country each; and only *P. pectinatus* is found in all the six areas of zoological distribution defined by A. R. Wallace. "The limitation of the species is undoubtedly somewhat difficult, as some of them are exceedingly variable, being split up into petty varieties which are merely the description of individuals, whilst happily others will not lend themselves to be so divided. Considered from the local point of view, this splitting up into varieties is of value so long as they are held to be local variations; studied in connection with their environment as to colour, depth, density, chemical composition of the water, &c., they would in time evolve many interesting facts on their origin and evolution." Mr. Bennett advises that the grass-leaved species should be cultivated, as was done by Fryer with so many of the broad-leaved ones; and useful hints for growing them are given.

A careful but concise key to the species is followed by a short sketch of the more important characters, in which due stress is laid on the value of ripe fruit for determination. After mentioning Koch's five main groups, and pointing out that some species combine the features of two or more, Fryer goes on to explain his use of special terms:—*Variety*, for more or less permanently differing variations of fertile species (hybrids appear to be, practically, always sterile); *state*, for transient differences, dependent on individual or local conditions; *forma*, for hybrids materially distinct from the plants originally described. "No attempt is made at unravelling the intricacies of synonymy"; therefore such very uncertain names as *P. compressus* L. and *P. gramineus* L. are discarded.

Brevity being desirable, I had better confine myself to a limited number of details; it should, however, be mentioned that Fryer rejected many of the alleged "varieties," though he usually, and quite wisely, described the known hybrids (sometimes spoken of as "hybrid species") with as much minuteness as the true species.

P. fluitans Roth is finally determined, in accordance with Beeby's original investigations, as being *P. natans* × *lucens*; and *P. Kirkii* Syme as (probably) *P. natans* × *polygonifolius*. It is pointed out that the resemblance between *P. natans* and *P. polygonifolius* is merely superficial, the latter possibly approaching *P. lucens* almost as nearly. Of the difficult *P. Drucei* from Berkshire, which "has the most beautiful foliage of any of our British forms," it is said that "probably Mr. Druce is correct in supposing it to be *alpinus* × *natans*." The true rank of *P. Griffithii* remains doubtful, pending further cultural experiments; but the balance of present evidence is in favour of its claim to specific rank. *P. serratus* Huds., after nearly ten years' observation, was found to be "merely a *state* which reverts on the same individual to the

typical form of the species"; and *P. crispus* var. *cornutus* is only the type. "*P. densus* is not very nearly allied to any other species in the genus, and probably will be separated under a subgeneric name, at least, when the whole of the Potamogetons shall be sufficiently known to make a monograph of the genus possible." *P. graminifolius* stands as distinct from the closely allied *P. heterophyllus*; this treatment has the advantage of convenience, besides its probable accuracy. Mr. Bennett notes that "to the end of his life Fryer was somewhat uncertain as to the specific validity" of *P. falcatus*; but the perfect fruit strongly favours its segregation. *P. nitens* (*curvifolius*) "is no one definite form, but is an aggregate of several distinct hybrids, all of which agree in having *P. perfoliatus* as one parent." This points to the need of working out the various plants which have been so named; I have gathered "nitens" several times in Scotland, and believe the whole series to be *P. heterophyllus* × *perfoliatus*, which were, in almost every case, the only possible factors. The name *P. Zizii* Mert. & Koch has been retained, "as that of *angustifolius* has, according to the Americans, been previously used in the genus"; but, unless this applies to a valid species, *P. angustifolius* Berchtold & Presl would appear to be right. On similar grounds, × *P. salignus* Fryer is made to displace × *P. decipiens* Nolte var. *salicifolius* Ar. Benn. (*P. salicifolius* Wolfgang). Under *P. zosteræfolius* it is noted that "the Scotch specimens are generally longer-leaved than the English, and more acute." *P. Sturrockii* (a most lovely plant, when fresh) retains its rank as a full species; it certainly looks quite different from any *pusillus* forms that I have seen. By a slip, *P. pectinatus* has been credited to eighty-eight 'counties,' instead of vice-counties. *P. marinus* L. (non Huds.) denotes a plant more familiar under the name of *P. filiformis* Nolte.

There are a few provoking, though unimportant typographical errors, which should have been rectified; but the intrinsic merit of the book is extremely high, and it should greatly help students abroad, as well as at home.

EDWARD S. MARSHALL.

The Thirtieth Annual Report of the Watson Botanical Exchange Club, 1913–1914. Cambridge: J. Webb & Co., Alexandra Street. 1915.

WHEN noticing (p. 91) the *Report of the Botanical Exchange Club* for 1913, we said that it seemed of exceptional interest; and the same may certainly be said of the Report whose name stands at the head of this notice. The inexhaustibility of the relatively few plants which make up the flora of this group of islands is nowhere more conclusively shown than in the Reports of these two Exchange Clubs. We do not know how far specimens of the more interesting of the plants commented on therein find their way into the leading Continental herbaria, but it is eminently desirable that both the Reports and specimens illustrating them should be represented in the chief Continental centres.

The Report is as usual edited by Mr. George Goode; the distribution of specimens this year has been made by Mr. J. E. Little, of Crofton, Hitchin, in whom we have an important accession to the ranks of British botanists, whether as observer or collector—excellence in one of these capacities does not necessarily imply excellence in the other. His long note on *Spartina Townsendii*—the International Rules require this spelling—accompanied as it is by two interesting views of its growth from photographs by Mr. H. S. Thompson, adds to our knowledge of this interesting plant and might fittingly have appeared in this Journal, where *S. Townsendii* had its beginning: we must, it appears, say *Spar'tina*, not *Sparti'na*. Mr. Little has numerous notes upon *Erophila*; with Mr. Marshall and Mr. Wheldon as co-workers it seems likely that the segregates of this pretty little plant will be thoroughly worked out.

Among the notes contributed by experts in certain genera may be mentioned those of Dr. Drabble on the Nominium Section of *Viola*, Major Wolley-Dod and Mr. Barclay on Roses, Mr. Rogers on *Rubi*, Messrs. Marshall and Linton on *Hieracia*, *Salices* and *Carices*; comments by the two last-named, Mr. C. E. Salmon, and Mr. Little are scattered through the Report. Among the longest and most interesting of the notes on individual plants are those on *Potentilla mixta*, *Melampyrum pratense* var. *ericetorum*, *Vicia gracilis* and *V. angustifolia* var. *Bobartii*, *Iberis amara* var. *rufi-caulis* and *Helianthemum Chamæcistus*, by Mr. A. J. Wilmott; the two last have a somewhat hortatory tone, but we have all been young! Dr. Moss has numerous interesting observations, especially upon *Salicornia*; we note that the amiability of the editor of the Report allows him to run counter to almost universal custom and the International Rules by spelling proper names without capitals—*e. g.* "smithiana": an idiosyncrasy which we ourselves, on account of Dr. Moss's characteristic—shall we say firmness?—and the value of his co-operation have been compelled to tolerate. Another matter connected with nomenclature which demands more space than can be afforded here, but which may be discussed more fully later, is indicated by Mr. Marshall's remark (p. 446) that "Rouy places *cordifolia* as his α. [of *Circæa lutetiana*], apparently considering it to be the normal plant" and Dr. Moss's naming (p. 457) *Quercus sessiliflora* Salisb. "*Q. sessiliflora* var. *genuina*": in each of these cases it would seem that the binominal has practically ceased to exist, its place being taken by a trinominal.

We are inclined to think (as indeed is sometimes admitted to be the case, see pp. 450, 451) that in certain instances the specimens submitted to the referees as identical must represent different forms: *e. g.* what Mr. Little, who collected it, describes as "a narrow-leaved form, with creeping, often arcuate stems and small flowers" of *Ranunculus Flammula*, appears to Mr. C. E. Salmon as "the ordinary form, perhaps a little narrower-leaved than usual," while Mr. Marshall places it under var. *radicans*, "but not extreme," and Mr. Jackson identifies it with var. *pseudo-*

reptans Syme. Under *Spergularia marginata* we read: "Yes; var. *glandulosa* Druce. E. S. M.: Yes; but my examples do not come under var. *glandulosa* Druce. C. E. S." Other examples occur elsewhere in the Report—*e. g.* under *Zannichellia palustris* and *Anthoxanthum odoratum*.

We regret that exigencies of space will not allow us to extract some of the more interesting of the notes for the benefit of our readers. Our omission to do so, however, emboldens us to suggest that the Reports should be made accessible to others than members of the Club at a reasonable price, as is already the case, though at a somewhat high rate, with those of the Exchange Club. We may be wrong in thinking that the work of British botanists on their native flora is insufficiently recognized abroad, and perhaps the present is not the best time for making the suggestion; but in any case their observations demand more general recognition than they are likely to receive if the circulation of the Reports is practically confined to the members of the Clubs. The actual date of issue should appear somewhere on the Report: the only dates in the present issue are "December 1914," with "1915" on the wrapper.

BOOK-NOTES, NEWS, &c.

Under the title *A Chaplet of Herbs* (Routledge, 2*s.* 6*d.* net), Miss Florence Hine has brought together in a very pretty little book a number of "gatherings from the early herbals." These are divided into two parts, the first containing passages relating to particular plants, the second to remedies for various diseases under which they are arranged. They are preceded by a charming introduction of twenty pages, in which the author summarizes some characteristics of herbals and herbalists in a manner which shows a wide and sympathetic acquaintance with the subject. It is to be regretted that Miss Hine did not submit her book to some botanist before publication, as it contains slips which would at once have been detected by an expert: thus she places together as synonymous "Eyebright—Speedwell—Euphrasie," though the plant which "show'd her sapphire blue" bears no relation to that described in the two extracts from Turner & Culpeper, nor indeed to the "Euphrasie" mentioned by Shenstone; nor is it easy to understand why "Gromel" is identified with chickweed: the "Sanicle" of the proverb quoted is not the same as "Bear's Ear" (Auricula). There is an excellent bibliography, which, were the fact not otherwise apparent, would show the great care that has been taken in this compilation.

At the meeting of the Linnean Society on May 7th, 1915, Dr. Sarah M. Baker and Miss Maude H. Bohling contributed a paper "On the Classification, Morphology, and Ecology of the Brown Seaweeds of the Salt Marsh." The authors treated the subject thus:—Classification: Five of the species of *Fucoideæ* common in Britain as inhabitants of rocky shores are represented by

peculiar varieties on the salt marsh. Evidence is brought forward to show that these forms, although they differ widely in their morphology from their rock ancestors, are to be regarded as adaptational varieties or "ecads," in the terminology of Clements. *Fucus vesiculosus* L. forms a long series of ecads whose diversity has caused some confusion in the nomenclature; they have appeared most commonly under the names *F. volubilis* Huds., *F. lutarius* Kütz., *F. balticus* Ag., *F. subecostatus* Ag., or as varieties of *F. vesiculosus* (var. *muscoides* Cott. and var. *spiralis* Farlow). These forms are parallel to but not identical with the series of forms, also derived from *F. vesiculosus*, found in the loose-lying associations of the Baltic, as described by Svedelius and Archichovsky. It is proposed to group all the salt-marsh ecads from each species under one megecad "limicola," whose chief characteristics—dwarf habit; vegetative reproduction; spirality or curling; and absence of attachment disc—are common to the marsh forms of all the species. Under this megecad of *F. vesiculosus* it is proposed to use the three ecads e. *volubilis* Huds., e. *cæspitosus*, and e. *muscoides* Cott., the name *F. balticus* Ag. being rejected as liable to cause confusion. A new marsh form is described, derived from *F. ceranoides* L. Morphology: Two general methods have been used to study the correlation between the morphological peculiarities of the marsh Fucoids and the new chemical and physical conditions of their environment. The first is to study the distribution of natural varieties of one species, and the second to examine in detail exceptional cases. These methods have led to the conclusions that dwarf habit is mainly conditioned by exposure and lack of nutrient salts. Vegetative reproduction is caused by the high humidity maintained over the marsh in the intertidal periods. This prevents the attainment of a limiting concentration in the cell-sap necessary as a stimulus to the formation of sexual reproductive organs. The cause of spirality is probably unequal distribution of nutrient salts. The same factors were shown to be operative in causing the change in morphology of the floating Sargasso weed. Ecology: Brown seaweeds may function on salt marshes either as pioneer vegetation, undergrowth, or covering vegetation after erosion, and in these capacities often play an important part in the economy of the marsh.

The number (vol. iv. No. 4) of the *Journal of Genetics* issued on April 26th contains several papers of botanical interest. Mr. R. P. Gregory has a note on the inheritance of heterostylism in *Primula acaulis* and a paper (with two plates) on variegation in *P. sinensis*. Mr. C. J. Bond writes on the primary and secondary sex characters and some abnormal *Begonia* flowers and on the evolution of the monœcious condition in plants (two plates); Dr. R. R. Gates defends himself somewhat warmly against the attacks of Mr. G. H. Shull (published in the *Journal of Genetics* for 1914) on his conclusions as to the origin and behaviour of *Œnothera rubricalyx*; Dr. A. E. Everest summarizes recent chemical investigations of the anthocyan pigments and their bearing upon

the production of those pigments in plants; and Miss M. Wheldale continues her summary of our present knowledge of the chemistry of the Mendelian factors for flower-colours.

It may be doubted whether a Londoner can obtain better value for a guinea than by spending it in becoming a member of the Royal Horticultural Society. For this sum he not only obtains admission to a number of interesting shows and lectures, but he also receives twice a year a thick part of the Society's *Journal*, which always contains a number of papers of botanical as well as of horticultural interest. In the number just issued in April, for example, we find a paper by Miss Edith Saunders on the history and literature of the Double Stock; a guide to the literature of Pomology, by Mr. E. A. Bunyard; an account of the Iris leaf-blotch disease (*Heterosporium gracile* Sacc.), by Mr. J. K. Ramsbottom; and a delightful essay on books for an amateur gardener's library, by Mr. E. A. Bowles. There are also numerous papers of purely horticultural interest, as well as a report of the proceedings of the various Committees of the Society.

We are indebted to M. R. Chodat for a copy of his interesting biography of the late William Barbey (Barbey-Boissier) (1842–1914) reprinted from the *Bulletin de la Société Botanique de Génève* for December last. The notice is accompanied by an excellent portrait in colour reproduced from an oil painting by the botanist's eldest son. A slight correction may be made as to the materials for Gaudin's *Flora Helvetica*, which it is stated that Barbey obtained by exchange from the Department of Botany of the British Museum: the exchange, we believe, was effected through Sir Joseph Hooker, representing Kew, Gaudin's plants being included in the Gay herbarium which came into Sir Joseph's hands for the purpose of selection and disposal.

The first part of the second section of vol. v. of the *Flora Capensis*, which appeared in April, contains the following orders: *Thymelæaceæ*, by Mr. C. H. Wright; *Penæaceæ* and *Geissolomaceæ*, by Miss E. L. Stephens, of the South African College, Cape Town; *Loranthaceæ*, by Mr. T. A. Sprague; *Santalaceæ*, by Mr. A. W. Hill; in the genus *Thesium*, in the last-named order, 128 species are enumerated, a large proportion of which were first described by Mr. Hill in the Kew *Bulletin*.

We understand that a Department of Plant Pathology for Great Britain and the Colonies has been established at Kew under the superintendence of Mr. A. D. Cotton, whose name will be familiar to our readers in connection with algology. He will have the assistance of Mr. W. B. Brierley, who has recently lectured on economic botany at the Victoria University, Manchester.

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THE

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BRITISH AND FOREIGN

EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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THE JOURNAL OF BOTANY was established in 1863 by Dr. Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of general Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains. In 1896 it became necessary to increase the size of the Journal, owing to the number of papers sent for publication: the number of plates was at the same time augmented.

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A REVISION OF SALMEA AND SOME ALLIED GENERA.

By S. F. Blake, A.M.

The genus *Salmea* of the helianthoid *Compositæ* was established by De Candolle in 1813 to contain three species, two of which had previously been described by Linnæus (*Salmea scandens* (L.) DC.) and Swartz (*S. hirsuta* (Sw.) DC.) under the genus *Bidens*, while the third (*S. eupatoria* DC.) was described as new, but is now generally referred to the synonymy of *S. scandens*. In 1817 Robert Brown (Trans. Linn. Soc. xii. 112) gave an emended generic character, and added the new species *S. ? curviflora* with a very brief description, which has since led to confusion in the treatment of this and one or two related Mexican species. In the *Genera Plantarum* of Bentham & Hooker fil., *S. curviflora* was specially mentioned as a true member of the genus, in spite of certain peculiarities; but in 1881 it was referred by Hemsley to the genus *Otopappus* Benth., where it has since remained. In 1819 Sprengel renamed the genus *Hopkirkia* (retained in his Syn. iii. 443 (1826)), because of the previous *Salmia* of Cav. (Ic. iii. 24, t. 246 (1794)) and *Salmia* of Willd. (Gesell. Naturf. Fr. Berl. Mag. v. 399 (1811)); but as neither of these genera is now accepted, the name *Salmea* is still valid by the International Rules of Nomenclature.

In 1827 three new species (*S. grandiceps*, *S. parviceps*, *S. oppositiceps* *) were described by Cassini from fragments in the Jussieu Herbarium. Although efforts have been made by some authors to retain one or another of them, all are now generally referred to the synonymy of *S. scandens*, despite the reference of *S. oppositiceps* by De Candolle and the *Index Kewensis* to *S. hirsuta* (Sw.) DC. During the 'forties Steudel transferred Sprengel's *Hopkirkia fruticulosa* to *Salmea*, *S. angustifolia* was described by Bentham from Mexico, and *S. salicifolia* Brongn., which seems from description to be a form of *S. scandens*, was described from material grown at the Jardin des Plantes. During the 'sixties a revision of the genus as known in the West Indies was given by Grisebach, and five new species were published by him and by Charles Wright.

In 1873 Bentham described in the *Genera Plantarum* two new genera nearly allied to *Salmea*—*Otopappus*, from Nicaragua, the type species of which was described and figured in 1873, and *Salmeopsis*, from Brazil, whose only species was also described and figured in 1873. Hemsley, in 1881, listed from Mexico and Central America three species of *Salmea*, one of which was new, and amended the character of *Otopappus* by including in it *O. curviflorus* (R. Br.) Hemsl. and the new species *O. epaleaceus* and *O. robustus*. In 1887 *Salmea nitida* Sch. Bip. MSS.

* It is probable that the specimens upon which these specific names were based are no longer in existence. M. F. Gagnepain, of the Paris Herbarium, writes me (under date March 23rd, 1915) that there are no specimens of *Salmea* in the Jussieu Herbarium.

was added to the synonymy of *S. scandens* by Klatt, and *Zexmenia* (*Otopappus*) *tequilana* was published by Gray from Palmer's Jaliscan collection of the previous year. In 1891 *O. alternifolius* was published from Mexico by Robinson. In the previous year Hoffmann, in the *Pflanzenfamilien*, following Gray's hint of 1887, had sunk *Otopappus* to sectional rank under *Zexmenia*, an act in which he is not likely to be followed by anyone acquainted with the characters of the genera concerned. In 1891, also, Watson described *S. Palmeri* from Jalisco, and in 1892 Britton published *S. mikanioides* from Bolivia, anomalous in the genus as then constituted by reason of its radiate heads, although these were not referred to in the original characterization.

Klatt in 1894, thoroughly misunderstanding the general character of *Otopappus*, transferred to it five species (*O. Aschenbornii*, *O. oaxacanus* (DC.), *O. olivaceus*, *O. perymenioides* (Sch. Bip.), *O. Robinsonii*), all of which, except the last, had previously been described by himself or other authors under *Verbesina*, to which genus they were retransferred by Robinson and Greenman in their revision of that genus in 1899. In 1895 Coulter published a variety of *O. curviflorus* (var. *glabratus* Coult.) from Guatemala.

In 1901 Urban published an important and suggestive paper on the group, in which the new genus *Notoptera*, based on *Bidens hirsuta* Sw., was described, with the new var. *Eggersii* Urb. and the insufficiently characterized *N. guatemalensis* Urb., and the relationships of *Salmea curviflora* R. Br., *S. mikanioides* Britton, and *Otopappus acuminatus* Wats. to *Notoptera* were discussed. After an examination of type material of the species concerned, it seems to the writer that the three species mentioned, with the exception of *S. mikanioides*, which certainly belongs to the genus *Zexmenia*, must, together with *O. epaleaceus* Hemsl. and *O. brevipes* Rob., be transferred to the genus *Notoptera* if the three genera are to be retained in full rank, a course which seems best to accord with the general treatment of this difficult group of the *Compositæ*. In 1904 Greenman described *Salmea Gaumeri* from Guatemala (transferred to *Notoptera* in 1907), and *Otopappus epaleaceus* var. (?) *Pringlei* from Southern Mexico, and transferred to *Salmea* Coulter's *Otopappus curviflorus* var. *glabratus* of 1895; and in 1905 *Otopappus syncephalus* J. D. Sm. was published from Guatemala. Robinson in 1909 described *Otopappus brevipes* from Chiapas, referring *O. curviflorus* var. *glabratus* Coult. to it as a variety, and uniting *O. acuminatus* Wats. as a variety to *Zexmenia tequilana* Gray, referred both to *Otopappus*. Brandegee, in the same year, published *O. xanthocarphus* from Purpus's Puebla collection of 1908. Since that date nothing of importance has been published on any of these genera.

The four genera here considered (*Salmea* DC., *Salmeopsis* Benth., *Notoptera* Urb., *Otopappus* Benth.) form a closely related group among the *Verbesininæ* with strongly compressed disk achenes. All have strictly opposite leaves and small heads,

strictly discoid in *Salmea* and *Salmeopsis*, either discoid or radiate (a character of no great importance in *Helianthoideæ*) in the other two genera, the rays when present being usually styliferous and fertile, rarely sterile. The receptacle varies from barely convex in *Otopappus* to long-conic in most species of *Salmea*, but does not afford a satisfactory basis for generic division, and the pales, involucre, stamens, and style-branches are too much alike throughout the group to present good characters. In a group of three discoid species (*Salmea curviflora*, *Otopappus brevipes*, and a new species), the disk corollas are strongly reflexed even from an early stage, but this character does not seem to be properly considered as of generic value, particularly since in other species with radiate heads a decided approach to the same condition is seen, and it is here taken as of merely sectional value. In default of other grounds for separation, one is compelled to have recourse to the fruit, from which characters may be drawn which, though sometimes leading to apparently anomalous results in the separation of species in all other characters seemingly very closely allied, are at any rate definite and stateable without compromising exceptions. The five collections in the British Museum, for instance, distributed under the names *Zexmenia tequilana* and *Otopappus acuminatus*, names which, as Dr. Robinson has recently shown, are specifically synonymous, are quickly divided into two groups according to the presence or absence of a paleaceous corona between the awns of the pappus. Once this separation is made, minor characters of leaf-form, pubescence, and involucre previously obscured by a too great suppositional allowance of intraspecific variability become manifest, and I have no hesitation in allotting full specific rank to each of the two specimens hitherto confused with *Zexmenia tequilana*, which possess the pappus-corona typical of *Otopappus*.

The salient characters of these genera, with those of their closest ally *Spilanthes*, may be expressed as follows:—

Achenes wingless.
  Squamellæ none.
    Herbs (two species frutescent) with solitary axillary and terminal long-peduncled heads, or these few in a terminal bracteate inflorescence on a long peduncle; achenes often callose-margined (Spilanthes L.)
    Shrubs with numerous cymose-panicled heads; achenes not callose-margined ..... Salmea DC.
  Squamellæ present, lance-linear, united to middle Salmeopsis Benth.
Achenes winged, at least obliquely on the inner side above, the wings confluent with the pappus-awns.
  Squamellæ entirely absent ..... Notoptera Urb.
  Squamellæ present, united into a more or less lacerate paleaceous corona adnate to the pappus-awns Otopappus Benth.

1. Salmea DC.

Heads always discoid, whitish. Involucre 2-sub-6-seriate, graduated; phyllaries rather few, ovate or ovate-lanceolate to oval, ± indurated, chartaceous- or membranous-coriaceous, sometimes with distinctly herbaceous apex, striate, obtuse or rounded to acute, appressed, sometimes with spreading apex. Receptacle conic to long-conic, many-flowered. Pales oblong, acutish, firm, persistent, folded about the achenes. Disk corollas erect, whitish, with short tube and broadly cylindric throat, 5-toothed, 5-nerved. Anthers minutely sagittate-cordate at base, with obtuse deltoid-ovate apical appendages. Style-branches obtusish, unappendaged, papillose-hirtellous toward apex. Achenes oblong, strongly compressed, blackish, with very narrow pale border or none, usually ciliate on margin and sometimes at apex (when the hairs simulate squamellæ, but are merely doubly tubular hairs like those of achene margin), bearing two upwardly ciliate subequal awns.—Erect or scandent shrubs, with always opposite leaves (except sometimes those of inflorescence), entire or toothed, glabrous or rarely even pilose, and cymose-panicled small whitish heads on axillary and terminal peduncles.—*Salmea* DC. Cat. Hort. Monsp. 140 (1813); Cass. Dict. Sci. Nat. xlvii. 87 (1827); DC. Prodr. v. 493 (1836); Urb. Sym. Antill. v. 255 (1907), *q. v.* for synonymy: all pro parte. *Hopkirkia* Spreng. Nov. Prov. 23 (1819); Syst. iii. 443 (1826), in part. "*Fornicaria* Raf. Sylva Tell. iii. 116 (1838)."

Key to Species.

Leaves ovate to ovate-oblong or -lanceolate, usually ± dentate, acute or rarely obtuse.
- Phyllaries indurated at least below, chartaceous-coriaceous, sometimes slightly herbaceous at the usually acute apex.
  - Heads very numerous, cymose-panicled on widely spreading axillary (and terminal) branches ..... 1. *scandens.*
  - Heads few or several, on erect peduncles or several-headed flowering-branches.
    - Heads numerous, on 3–11-headed peduncles... 2. *Palmeri.*
    - Heads few (ca. 5–11), on 1–3-headed peduncles ..... 3. *oligocephala.*
- Phyllaries submembranous, the apex usually rounded, never herbaceous.
  - Stem and leaves densely rufous-pilose ..... 4. *sessilifolia.*
  - Stem and leaves glabrous.
    - Leaves ovate, 3–3·8 cm. long, 2–2·5 cm. wide ..... 5. *glaberrima.*
    - Leaves ovate-lanceolate, 3–3·7 cm. long, 8–13 mm. wide ..... 6. *caleoides.*

Leaves cuneate-obovate, thick, entire, rounded at apex ..... 7. *petrobioides.*

Sect. 1. EUSALMEA Griseb. Fl. Br. W. Ind. 375 (1861), incl. sect. *Pseudocalea* Griseb. Cat. Pl. Cub. 155 (1866). Receptacle linear-conic. Achenes marginally ciliate. Heads not glutinous.

1. S. SCANDENS (L.) DC. Scandent shrub, as much as 10 m. high. Leaves ovate to oblong-ovate, acuminate at apex, cuneate to rounded or truncate at base, very rarely even slightly cordate, rather remotely repand-serrulate or rarely subentire, penni- to tripli-nerved, coriaceous and shining, glabrous or sparsely puberulous on midnerve beneath, 5–12·5 cm. long, 2–5 cm. wide, on petioles 5–15 mm. long. Heads variable in size, 4·5–7 mm. high in anthesis. Involucre 2·5–4 mm. high, the phyllaries about 3-seriate, irregularly graduated, subindurate and ribbed, chartaceous-coriaceous, with scarious margin, varying from oval and rounded to ovate-lanceolate and acuminated to the obtusish apex, ciliolate, otherwise nearly or quite glabrous.—*Bidens scandens* L.! Sp. ii. 833 (1753). *Salmea scandens* (L.) DC. Cat. Hort. Monsp. 141 (1813); Sims, Bot. Mag. xlvi. t. 2062 (1819); Urb. Sym. Antill. v. 256 (1907), *q. v.* for synonymy (excl. syn. *Bidens fructescens* Mill., which = *Zexmenia costaricensis* Benth.; see Journ. Bot. liii. 13 (1915)). *Salmea eupatoria* DC. *l. c.* 141 (1813). *Spilanthes nitida* Llav. in Llav. & Lex. Nov. Veg. i. 28 (1824). *Salmea grandiceps* Cass. Dict. Sci. Nat. xlvii. 88 (1827). *S. parviceps* Cass. *l. c.* 88 (1827). *S. oppositiceps* Cass. *l. c.* 89 (1827). *S. salicifolia* Brongn. ex Neum. Rev. Hortic. ser. 3, i. 87 (1847), ex char. *S. nitida* (Llav.) Sch. Bip. ex Klatt, Leopold. xxiii. 145 (1887), as syn. *Verbesina scandens* Klatt, Leopold. xxv. 106 (1889).—A variable species, ranging from the West Indies to Vera Cruz and Guerrero, south to Bolivia; also Ibitimi, Paraguay, *Balansa*, 760 (hb. Kew; referred to *Salmeopsis Claussenii* Benth. by Baker, Fl. Bras. vi. pt. 3, 217). Divisible on involucral characters into two varieties.

Var. GENUINA. Squamis involucri ovatis ad ovato-lanceolatis acutis ad acuminatis. The typical and widespread form, to which belong Linnæus's types (*Houstoun*, Vera Cruz, in hb. Brit. Mus.).

Var. OBTUSATA. Squamis involucri ovalibus apice rotundatis. VERA CRUZ: Valley of Cordova, Dec. 20th, 1865–66, *Bourgeau*, 1551 (hb. Kew). GUATEMALA: Alta Vera Paz, near Coban, alt. 1342 m., March, 1879, *Türckheim*, 392 (type, Brit. Mus.; the Kew specimen of this number is var. *genuina*); Coban, alt. 1350 m., February, 1908, *Türckheim*, II. 993 (Brit. Mus.).

2. S. PALMERI Wats. Proc. Am. Acad. xxvi. 141 (1891). Erect, apparently not scandent, glabrate or strigillose in inflorescence, the branches erect or divergent-ascending. Leaves oblong-ovate to ovate or rarely oval, acute, at base rounded to cuneate, coriaceous-thickened, triplinerved, strongly pallid-reticulate, slightly repand-dentate, light green and glabrous both sides (sometimes with a few hairs on margin and nerves), 4·5–9·8 cm. long, 1·5–4·5 cm. wide; petioles 2·5–7 mm. long. Disk 8–9 mm. high, 5–6 mm.

wide. Involucre 3-seriate, slightly graduated, 4–4·5 mm. high; phyllaries lance-ovate to (outer) oval, acute or (outer) subacuminate, densely ciliate and ± pilosulous, strongly indurated below, striate, subherbaceous at the usually spreading apex. Achenes ciliate, tuberculate-pilose on sides above, 2·2 mm. long.—Jalisco: Rio Blanco, 1886, *Palmer*, 528 (cotype: Brit. Mus., Kew); canyons near Guadalajara, October, 1889, *Pringle*, 2345 (cotype: Brit. Mus., Kew); barranca of Rio Blanco, near Guadalajara (type locality), alt. 1525 m., October 14th, 1903, *Pringle*, 11567 (Kew).

3. S. oligocephala Hemsl. Biol. Centr. Am. Bot. ii. 194 (1881).—Erect, apparently simple and not scandent, the stem tuberculate-strigillose, the inflorescence sordid-pilosulous-hispidulous. Leaves ovate to ovate-oblong, acute, rounded at base, serrate to subentire, triplinerved, reticulate, light green both sides, glabrous above except on margin, tuberculate-strigillose to hispid-pilose on nerves beneath, 4·8–9 cm. long, 2–4·1 cm. wide; petioles 1·5–3 mm. long. Disk 9–11 mm. high, 9–12 mm. wide. Involucre 3-seriate, slightly graduated, 5–6 mm. high; phyllaries lanceolate to ovate or oblong-ovate, acutish to obtusish, ciliate, rather densely pilosulous with yellowish-white hairs, indurated below, scarcely striate, subherbaceous at the narrow appressed apex. Achenes ciliate, glabrous on sides, 3·4 mm. long.—Hidalgo: Zimapan, *Coulter*, 349 (cotype: Kew). Mexico: without locality, 1846, *Baites* (cotype: Kew).

4. S. sessilifolia Griseb. Fl. Br. W. Ind. 375 (1861). Stem stout (8 mm. thick), apparently scandent, like the leaves and inflorescence densely rufous-pilose with slightly roughish many-celled matted hairs. Leaves ovate, acuminate, rounded or truncate-rounded at base, repand-dentate, penninerved, sometimes subglabrate above, 6·5–12 cm. long, 3·5–7·5 cm. wide; petioles 3–9 mm. long. Heads numerous in irregular cymose panicles. Immature disk 4·5 mm. high, 4·5 mm. thick. Involucre 5-sub-6-seriate, 4·5 mm. high, graduated; phyllaries oval to oval-oblong, rounded to acutish at apex, ± rufous-puberulous, submembranaceous, scarcely indurated, about 3-nerved. Achenes (immature) ciliate, sparsely pubescent on sides above, 2-awned.—Jamaica: Westmoreland Mountains, January, 1844, *Purdie* (types: Kew).

5. S. glaberrima C. Wright in Griseb. Cat. Pl. Cub. 155 (1866). Slender, strictly glabrous except for one or two hairs on the midribs of the nerves beneath. Leaves ovate, acute, at base truncate or rounded, very obscurely and remotely serrulate or the upper entire, triplinerved, subcoriaceous, somewhat reticulate, 3–3·8 cm. long, 2–2·5 cm. wide, on petioles 4·5–5 mm. long. Heads about twenty-six in a terminal cymose panicle 4 cm. in diameter, which is sessile and 2-leafy-bracted at base; pedicels 2·5–10 mm. long. Involucre 3-seriate; phyllaries oval or oblong-oval, truncate to rounded at the erose apex, glabrous or ciliolate above.—Cuba: *Wright*, 2855 (type coll.: Brit. Mus., Kew).

6. S. CALEOIDES Griseb. Cat. Pl. Cub. 155 (1866). Slender shrub with ± resinous branches, bearing a terminal 8-headed cymose panicle 2·8 cm. broad. Leaves ovate-lanceolate, acuminate, obliquely cuneate at base, obscurely repand-dentate, triplinerved, somewhat paler and venose beneath, subcoriaceous, 3–3·7 cm. long, 8–13 mm. wide. Peduncle glutinous, ca. 6 cm. long; pedicels naked or bracteolate, 3–8 mm. long. Disk (fruit) 8 mm. high, 6–7·5 mm. wide. Involucre 4-seriate, barely graduated, 4 mm. high; phyllaries elliptic-oblong (2·5 mm. wide), rounded or truncate at the slightly erose apex, thin, glabrous. Disk corollas 1·8 mm. long. Achenes sparsely ciliolate, 2 mm. long.—CUBA: *Wright*, 2856 (type coll.: Kew).

Sect. 2. STERRHANTHEMUM Griseb. Fl. Br. W. Ind. 375 (1861). Receptacle conic. Achenes not ciliate. Heads resinous, in dense terminal fastigiate flattish-topped cymose panicles.

7. S. PETROBIOIDES Griseb. Fl. Br. W. Ind. 375 (1861). Shrub 1·3 m. high. Leaves strongly 1-nerved, 1·9–3·4 cm. long, 8–15 mm. wide. Involucre 2-seriate; phyllaries very few, unequal, ovate-oblong to oval, obtuse, indurated and ribbed, scarious-margined. Achenes oblong, glabrous except at apex where provided between the awns with a row of minute cilia simulating squamellæ.—Baker in Hook. Ic. xix. t. 1805 (1889). *S. petrochioides* Hook. & Jacks. Ind. Kew. ii. 787 (1895), sphalm. *Salmia petrobioides* Hook. & Jacks. *l. c.* (1895), sphalm. *Salmea pteroboides* Millsp. Field Col. Mus. Bot. ii. 108 (1900), sphalm.—BAHAMAS: New Providence, various collectors; Hog Island, *Eggers*, 4259 (Kew). Also Grand Cayman and Cayman Brac, *fide* Millspaugh, *l. c.*

TRANSFERRED AND INVALID SPECIES OF SALMEA.

S. angustifolia Benth. Bot. Sulph. 117 (1844) = VERBESINA ANGUSTIFOLIA (Benth.), n. comb. Most closely related to *V. Seemannii* Sch. Bip., with the type of which (*Seemann*, 3027) it has been compared at Kew, but differing in characters of fruit, inflorescence, and pubescence. Bentham's brief characterization may be supplemented by the following description of the type:—Branching shrub, with glabrate grayish stem, the branches slender, erect, densely leafy, closely tuberculate-hispidulous with stiff wide-spreading hairs. Leaves lanceolate, acute to acuminate at each end, very obscurely serrulate, apparently slightly revolute, dull green above, harshly tuberculate-hispidulous, the swollen hair-bases persistent and conspicuous, beneath scarcely paler, rather densely and subharshly tuberculate to tuberculate-hispidulous along the venation with short stiff whitish hairs, 5·5–8·5 cm. long, 1·4–2·2 cm. wide, on marginless exauriculate tuberculate-strigillose petioles 1–2 mm. long. Heads several (probably cymose-panicled), exceeded by the leaves, on densely spreading-hispidulous peduncles and pedicels, about 9·5 mm. wide in fruit. Involucre (not well seen) about 1·5 mm. high, sub-2-seriate; phyllaries broadly ovate, obtusely mucronate, glabrous or nearly so. Rays not seen (none, *fide* Bentham). Disk corollas yellow, densely dull-puberulous

below, 2·8 mm. long (tube 0·8 mm.). Pales broad, obovate, gibbous, puberulous on the distinct keel, the short apex recurved-spreading, 3·3 mm. long. Achenes obovate, blackish, sparsely puberulous above, narrowly or rather broadly winged on one or generally both angles, the wings unequal or subequal, ciliate above, adnate to the awns (0·8–1·1 mm. long) at base; achene (excluding wing) 1·5–2·8 mm. long.—Mexico: western coast, 1839, *Barclay* (Kew).

S. curviflora R. Br. See *Notoptera* (No. 4).

S. curviflora R. Br. var. *glabrata* (Coult.) Greenm. See *Otopappus* (No. 8).

S. Eupatoria DC. = S. SCANDENS (L.) DC.

S. FRUTICULOSA (Spreng.) Steud. Nom. ed. 2, i. 775 (1841) = SIMSIA FRUTICULOSA (Spreng.), n. comb. (*Hopkirkia fruticulosa* Spreng.! Sys. iii. 444 (1826); *Armania fruticulosa* (Spreng.) Bertero ex DC. Prodr. v. 576 (1836); *Encelia fruticulosa* (Spreng.) Hieron. Bot. Jahrb. xix. 54 (1894), as to syn. only.) The relationship of this species to its nearest allies will be discussed elsewhere.

S. Gaumeri Greenm. = *Notoptera Gaumeri* Greenm.

S. grandiceps Cass. = S. SCANDENS (L.) DC.

S. hirsuta (Sw.) DC. = NOTOPTERA HIRSUTA (Sw.) Urb.

S. mikanioides Britton, Bull. Torr. Club, xix. 150 (1892) = ZEXMENIA MIKANIOIDES (Britton), n. comb. Careful study of the available material of this Bolivian species (*Rusby*, 1739 (type), *Bang*, 1486, 2120) shows clearly that it belongs to *Zexmenia*, where its nearest ally is an undescribed species from Columbia (in Kew Herb.). The linear-cuneate achene is slightly laterally constricted below the apex, narrowly winged on one side, and bears two slender divergent awns united at base by a very low marginal pappus-cup, as in *Z. podocephala* Gray and some other species of the genus.

S. nitida Sch. Bip. ex Klatt = S. SCANDENS (L.) DC.

S. oppositiceps Cass. = S. SCANDENS (L.) DC.

S. parviceps Cass. = S. SCANDENS (L.) DC.

S. pauciceps Griseb. Cat. Pl. Cub. 155 (1866) = SPILANTHES PAUCICEPS (Griseb.), n. comb. Mature achenes (*Wright*, 2854 (type), hb. Kew) elliptic-obovate, with distinct crustaceous margin, strongly ciliate with stiffish hairs, appressed-pubescent on the sides above, merely bidentate at apex, 2·5 mm. long, 1·1 mm. wide; heads few (4–6), subumbellate or racemose at end of a long naked peduncle, the pedicels 0·5–2·5 cm. long, bracteolate at base; receptacle long-conic, the pales deciduous. In characters of inflorescence strictly comparable with many specimens of *Spilanthes ocymifolia* (Lam.) A. H. Moore (*S. alba* L'Hér. and auth. generally); in involucre and frutescent stem very similar to *Spilanthes insipida* Jacq., its closest ally, likewise endemic in Cuba. It may be noted that the character generally supposed to distinguish *Salmea* from *Spilanthes*—namely, that the species of the former are frutescent, of the latter herbaceous—fails in these two species, although the true distinctive marks of these genera, to be found in the inflorescence (a many-headed cymose panicle

in *Salmea*; of solitary axillary and terminal heads, or these few (2–6) on bracteolate pedicels on a common peduncle, in *Spilanthes*), are strengthened rather than weakened by the inclusion of *S. pauciceps* in *Spilanthes*. Despite Jacquin's original description of the stems of *S. insipida* as "fruticosi," a character well shown by specimens in the British Museum collected in Cuba by Rugel (No. 6), authors generally seem to have determined that all the species of the genus must be herbaceous, and they are described by Bentham (Gen. ii. 381) as "herbæ annuæ v. rarius perennes," by Hoffmann (Nat. Pfl. iv. pt. 5, 237) as "Kräuter," and by A. H. Moore in his revision of the genus (Proc. Am. Acad. xlii. 522 (1907)) as "herbaceæ." Aside from these two shrubby species, however, which cannot be referred to *Salmea* without destroying the distinction between the two genera, all the species of *Spilanthes* seem to be herbaceous.

S. petrochioides Hook. & Jacks. (sphalm.) = S. PETROBIOIDES Griseb.

S. pteroboides Millsp. (sphalm.) = S. PETROBIOIDES Griseb.

S. salicifolia Brongn. = S. SCANDENS (L.) DC.

II. SALMEOPSIS Benth.

Heads discoid, whitish. Involucre 3–4-seriate, graduated; phyllaries deltoid-ovate to (inner) oblong-ovate, indurate below, subcoriaceous-chartaceous, densely strigillose-pilosulose, in age subglabrate, with short narrow loose or spreading herbaceous tips. Receptacle convex. Anther-appendages oval, rounded at apex. Achenes ciliolate. Pappus of 2 subequal awns and 8–14 slender acuminate squamellæ, united about to middle, and at base to the awns. Otherwise as in *Salmea*.—*Salmeopsis* Benth. in B. & H. fil. Gen. Pl. ii. 381, no. 412 (1873); in Hook. Ic. xii. 47, t. 1152 (1873); Baker in Mart. Fl. Bras. vi. pt. 3, 216 (1884).

1. S. CLAUSSENII Benth. in Hook. Ic. xii. 47, t. 1152 (1873). Stem glabrous or glabrate below, sparsely strigillose in inflorescence. Leaves ovate or oblong-ovate, acute to acuminate, rounded at base, shallowly repand-dentate (teeth 6–7 pairs, depressed, spreading-mucronate), 3-nerved, reticulate, rather thin but subcoriaceous, glabrous except for a few hairs on the nerves, 5–8 cm. long, 2·1–4·2 cm. wide; petioles 2·5–8 mm. long. Heads about 13–19, on 2–5-headed alternate or opposite peduncles 0·6–8·5 cm. long, terminal and subterminal, minutely bracted at base, or from the uppermost axils; pedicels 2–9 mm. long. Disk hemispheric, 7 mm. long, 7 mm. thick. Involucre 4 mm. high. Disk corollas 3 mm. long (tube 0·8 mm.), strigillose above. Achene (immature) tuberculate-hispidulous-ciliolate, otherwise glabrous, 3·2 mm. long, 0·9 mm. wide. Awns 2, ciliate, 2·3 mm. long; squamellæ sometimes bifid at apex.—BRAZIL: Minas Geraes, 1840, *Claussen* (types: Kew). The specimen from Paraguay (*Balansa*, 760, in hb. Kew) referred to this species by Baker in the *Flora Brasiliensis* proves to belong to *Salmea scandens* (L.) DC., and the species is confined to Brazil so far as known at present.

III. Notoptera Urb. (ampl.)

Heads homogamous or heterogamous, the outermost florets sometimes ligulate and sterile, those of disk hermaphrodite, fertile. Involucre 2-sub-6-seriate, graduated, the phyllaries appressed, oblong-lanceolate to ovate or ovate-oblong, obtuse to acutish, ± indurated and striate, chartaceous-subcoriaceous, generally slightly herbaceous along midline and at apex or with distinct short spreading herbaceous tips, the outermost sometimes entirely herbaceous. Receptacle convex. Rays when present ♀, oblong, usually numerous, yellow; disk corollas white or yellow, tubular, straight or abruptly recurved, with slender tube and funnel-form to campanulate-funnel-form throat, 5-toothed. Pales stiffish, persistent, acute to obtuse, embracing the achenes. Achenes of ray trigonous, 3-awned, narrowly 3-winged; of disk oblong to obovate, strongly compressed, glabrous or nearly so, often striate, narrowly winged or wingless on the outer side, there with a naked or winged short awn, on the inner broadly and obliquely winged above, the wing adnate to the longer pappus-awn; squamellæ none. Anthers sagittate at base, with ovate apical appendages. Style-branches obtusish to acute, unappendaged, papillose-hirtellous towards apex.—Erect or scandent shrubs, sometimes 10 m. high, with always opposite oval to ovate or ovate-lanceolate acuminate or rarely round-tipped entire or dentate leaves, the small or medium heads in terminal and axillary few- to many-headed cymose panicles.—*Notoptera* Urb. Sym. Antill. ii. 465 (1901).

Key to Species.

Heads discoid.
  Corollas erect.
    Leaves acuminate ..... 1. *hirsuta.*
    Leaves obtuse or round-tipped..... 2. *guatemalensis.*
    3. *Gaumeri.*
  Corollas reflexed; achene wings glabrous.
    Leaves merely sparsely strigillose beneath ... 4. *curviflora.*
    Leaves densely tomentulous beneath.
      Pedicels 4–10 mm. long, the panicle loose... 5. *scabridula.*
      Pedicels 2–3 mm. long, the panicle dense ... 6. *brevipes.*
Heads radiate.
  Heads numerous; involucre 3·5–4 mm. high ... 7. *tequilana.*
  Heads few; involucre 8 mm. high ..... 8. *epaleacea.*

Sect. 1. **Eunotoptera,** n. sect. Capitula parva discoidea turbinato-obovoidea. Clinium convexiusculum. Corollæ erectæ. Alæ achenii ciliatæ vel glabræ. Antheræ basi acute sagittatæ. Rami styli acuti.—Type, *N. hirsuta* (Sw.) Urb.—Jamaica and Central America.

(To be continued.)

MYCETOZOA OF AUSTRALIA AND NEW ZEALAND.

PART I., W. N. CHEESMAN, F.L.S., PART II., G. LISTER, F.L.S.

I.

THE Mycetozoa recorded in this list were collected chiefly during the meeting of the British Association in Australia, and afterwards in a short visit to the North Island, New Zealand, in the months of August and September, 1914.

The climate of Temperate Australia is usually wet in the winter months, from June to August, and dry for the rest of the year, but owing to the uncertainty and inequality of the rainfall, long droughts followed by floods are apt to disturb the regularity of the seasons. We arrived after a long spell of dry weather, and during the visits we paid to the States of West Australia, South Australia, Victoria, New South Wales, and Queensland dry conditions prevailed. In spite of this, in the scanty time available for collecting, fifty-one species of Mycetozoa were found. Few plasmodia were seen, and these only in damp fern gullies, but patches of sclerotium were frequently observed.

The climate of New Zealand is moist and genial, and very similar to that of the south-west of England. Twenty-two species of Mycetozoa were collected during my visit to Auckland and the region of the Hot Springs.

I will now describe the opportunities I had for collecting in the districts visited.

One day at Perth, West Australia, was occupied by a motor ride through King's Park, by the banks of the Swan River, and to the Zoological Gardens; here *Comatricha typhoides* was obtained.

In South Australia, two days were spent in the National Park, situated in the Mount Lofty Range twelve miles from Adelaide. Sixteen species of Mycetozoa were found here; as in the Handbook compiled for the use of the members of the British Association it is stated that only two species of Mycetozoa were recorded for South Australia, these gatherings were distinctly encouraging. *Physarum contextum* occurred on dead Eucalyptus leaves, and *Physarum vernum* on the shed bark of the Ribbony Gum (*E. viminalis*); *Arcyria insignis*, distinguished by its salmon-pink capillitium, was found on decaying wood. During a motor trip to the vineyards and distilleries of Angaston and Tanunda *Physarum citrinum* was obtained in the bright yellow plasmodium stage, and was tenderly nursed to maturity.

In Victoria the fern gullies in the beautiful Melbourne Botanical Gardens yielded *Trichia verrucosa* and *T. lateritia* in abundance, and a few sporangia of the rare *T. erecta*. In the grounds of Melbourne University *Craterium minutum* and *Arcyria incarnata* var. *fulgens* were obtained. On a week-end trip to Ballarat (1500 ft. alt.), *Physarum gyrosum* was gathered on dead leaves, and *Arcyria incarnata* var. *fulgens* on decayed wood; both were found in a pine plantation at the Creswick State Nursery.

In New South Wales, during a visit to Manley Beach, Sydney

Arcyria ferruginea was found on a decaying log of She-oak (*Casuarina*), and at a garden-party at Government House, Rose Bay, *Stemonitis splendens* was obtained from a pine stump. At Katoomba, in the Blue Mountains, at an elevation of 3360 ft., amidst magnificent scenery, we gathered *Physarum flavicomum*, *P. viride*, and *Comatricha typhoides*. Katoomba is one of Sydney's favourite health resorts, near the famous Jenolan Caves; it is surrounded by well-wooded mountain ranges and moist flat-bottomed valleys, many square miles in extent, with deep precipitous sides clothed with rich wild vegetation. A day was pleasantly spent in the National Park of New South Wales; here *Hemitrichia Serpula* was found on the dead stump of a Grass Tree (*Xanthorrhœa* sp.), quite three feet from the ground, and *Diachæa leucopoda* and *Physarum viride* var. *incanum* on decaying twigs; but this place was not rich in Mycetozoa, probably owing to the gritty nature of the crumbling rocks causing rapid drainage and not favouring the accumulation of humus.

In Queensland we visited Nambour, in the Blackall Range, fifty miles from Brisbane, passing *en route* dense jungles of beautiful tropical vegetation, as well as sugar-cane and pineapple fields. A considerable extent of land was covered with Queensland's greatest pest, the *Opuntia*, or Prickly Pear. On its dead uprooted stems *Physarum nutans* var. *leucophæum* was found. A trolley ride through sugar-cane fields took us up the Nambour Gorge to the top of the Blackall Mountains. Here the trees were rich in epiphytic ferns and orchids. *Badhamia utricularis* was found amongst grass at the foot of a dead trunk covered with the leathery fungus *Schizophyllum commune*; in all probability the plasmodium had fed on the fungus before retiring to the grass to pass into its reproductive stage, but no trace of it was found on either the *Schizophyllum* or the bark. On this expedition I also collected *Dictydium cancellatum*, *Tubifera ferruginosa*, *Hemitrichia clavata*, and *Dianema corticatum*. Near Enoggara, a suburb of Brisbane, in tropical bush, were found *Stemonitis splendens*, *Arcyria incarnata*, and several species of *Trichia*.

The meeting of the British Association in Australia ended on September 4th, and the members will long remember the kind hospitality they enjoyed during their month's tour through the continent. After this somewhat strenuous period it was restful to spend a quiet fortnight with friends at Moruya, a little town on the southern coast of New South Wales, at the edge of a thousand square miles of primeval bush. This bush is composed of large trees, mainly Eucalyptus and Casuarina, growing some distance apart, with the ground between covered with bushes and creepers 3 to 10 ft. high. On the high open spaces "Burrawangs" (Cycads) occupied many acres in extent; in the deep gullies the vegetation was dense and interlaced, ferns and hepatics abounded in the moist places, and fallen trees crumbled to decay and were not consumed by termites, as they are on the high ground. Disregarding warnings about snakes, centipedes and scorpions, and braving the torments of mosquitoes, ticks, and sand-flies,

much collecting was done at leisure, and many species of Mycetozoa were gathered. *Colloderma oculatum* was found in a wet gully developing from inky-grey plasmodium which covered a fallen log of Iron-bark (*Eucalyptus sideroxylon*), and much of it was successfully brought to maturity indoors. A fine growth of the minute and inconspicuous species *Clastoderma Debaryanum* was also obtained here, and the rare *Physarum dictyospermum*; *Dictydiæthalium plumbeum* appeared in patches six to nine inches across covering dead leaves and twigs, and sending up clouds of ochraceous spore-dust when disturbed. *Leocarpus fragilis* was found to have travelled eighteen inches up the stem of the Cycad *Macrozamia spiralis* before forming sporangia. *Diderma radiatum* and *Comatricha irregularis* were also found, and abundance of *Trichia Botrytis* and *T. lateritia*. The welcome breakdown of a motor-car in the bush between Moruya and Nowra gave an opportunity for gathering in a new locality and recording half-a-dozen species. Altogether thirty-four species were found in this district.

The next collecting centre was in New Zealand, in the vicinity of Auckland; here *Trichia verrucosa*, *T. decipiens*, and *Hemitrichia Vesparium* were obtained. We then visited Rotorua, in the centre of the Hot Springs district, and within easy reach of the virgin bush. This consists of a dark, dense and almost impenetrable growth of vegetation, fringed on the outskirts with Dracænas and Tree-ferns; the ground and fallen trees are covered with filmy-ferns, mosses, and fungi. Collecting was difficult by reason of the entangling "supple-jacks" (*Rhipogonum scandens*, closely allied to *Smilax*) and "prickly lawyers" (*Rubus australis*), but we were free from the troublesome insects of the neighbouring continent. Among the twenty-two species of Mycetozoa obtained were *Cienkowskia reticulata*, *Physarum viride* var. *aurantium*, *Comatricha nigra* var. *alta*, and *Stemonitis splendens*; the last formed a huge patch on a log partly covered with silica deposit at the edge of Lake Rotorua, amidst the steam and sulphurous fumes from adjacent geysers.

I desire to express my thanks to Miss G. Lister for examining the gatherings, and for her notes on the species.

W. N. Cheesman.

II.

The following notes refer to the Mycetozoa collected by Mr. Cheesman, which he kindly submitted to me for examination. Over one hundred and fifty specimens were obtained; although no new species occurs amongst them, the collection is of much value in extending the known range of many species, some of which have hitherto been considered rare.

My information as to previous records of Australian Mycetozoa is based chiefly on the collections in the herbaria of Kew and the British Museum; these have not been enriched by many gatherings from the Antipodes of late years, but it is probable that a number of further records have been obtained there. Our knowledge of

New Zealand Mycetozoa was much extended by Miss Hibbert Ware's researches in the North and South Islands and in Stewart Island in 1904.*

I have drawn up the following table (see pp. 207–8) showing the species occurring in Australia, Tasmania, and New Zealand, and mark with a cross (×) records made before Mr. Cheesman's visit, and with C the localities where, as far as I am aware, his record is the first. It will be seen at a glance how much our knowledge of the distribution of Mycetozoa has been increased as the result of his enthusiastic labours, and it is to be hoped that his success may induce some of those residing in the great continent, of which we have still so much to learn, to follow his example along similar lines of research.

Ceratiomyxa fruticulosa (Muell.) Macbr. Moruya, N. S. W. This species is very abundant in New Zealand, and probably is so also in many parts of Australia in favourable seasons.

Badhamia utricularis (Bull.) Berk. Blackall Mts., Q., on grass at the base of a dead tree covered with *Schizophyllum commune*; typical.

Physarum melleum (Berk. & Br.) Massee. Near Adelaide, S. A., on leaves. The specimen is immature, but the tawny-yellow sporangia on nearly white stalks are typical.

P. citrinum Schum. Near Tanunda, Adelaide, S. A. Obtained in the plasmodium stage and matured indoors; the nearly white stalks at first suggested *P. sulphureum* Alb. & Schw.; the rigid densely branching capillitium and yellow lime-knots are, however, characteristic of *P. citrinum*.

P. dictyospermum Lister. Moruya, N. S. W., on twigs and bark. This is similar to the type gathered in Stewart Island, N. Z., by Miss Hibbert Ware, except that the black stalks are more uniformly slender. The only other known gathering of this inconspicuous species was obtained in the Jura Mountains, Switzerland, in November, 1912, by M. Ch. Meylan; in this the spores, instead of being closely and regularly reticulated as in the type, are marked with an irregular broken reticulation of short thickened ridges and warts.

P. viride (Bull.) Pers. Adelaide, S. A.; Katoomba and Nowra, N. S. W.; and near Brisbane, Q.—Var. *aurantium* Lister. Rotorua, N. Z.—Var. *incanum* Lister. National Park, Sydney. The sporangia in this specimen are pale yellow on one side and nearly white on the other, as if they had been bleached by exposure to strong light.

P. flavicomum Berk. Sydney, Katoomba, and Moruya, N. S. W.; and Nambour, Blackall Mts., Q. The gatherings from Moruya and Nambour are typical, with slender orange-brown stalks, iridescent sporangia 0·35 mm. diam., slender, widely-branching capillitium and purplish nearly smooth spores, 9 μ diam. The specimens from Katoomba and National Park, Sydney, are un-

* See "Mycetozoa of New Zealand," by A. and G. Lister, Journ. Bot. xliii. pp. 111–114 (1905).

TABLE OF MYCETOZOA RECORDED FROM AUSTRALIA, TASMANIA, AND NEW ZEALAND.	W. Australia	S. Australia	Victoria	New South Wales	Queensland	Tasmania	New Zealand
Ceratiomyxa fruticulosa (Muell.) Macbr.	—	—	—	C	—	—	×
,, ,, var. *flexuosa*	—	—	—	—	C	—	—
Badhamia utricularis (Bull.) Berk.	—	—	—	×	—	—	—
Physarum melleum (Berk. & Br.) Mass.	—	C	—	—	—	—	—
,, *globuliferum* (Bull.) Pers.	—	—	—	—	—	—	×
,, ***citrinum*** **Schum.**	—	C	—	—	—	—	×
,, *dictyospermum* Lister	—	—	—	C	—	—	×
,, ***viride*** **(Bull.) Pers.**	—	C	—	C	—	×	×
,, ,, **var. *aurantium***	—	—	—	—	—	—	C
,, ,, **var. *incanum***	—	—	—	C	—	—	—
,, ***flavicomum*** **Berk.**	×	—	—	×	C	—	×
,, ***nutans*** **Pers.**	×	—	—	—	—	×	×
,, ,, **subsp. *leucophæum***	—	—	×	C	C	—	×
,, *pusillum* (Berk. & Curt.) Lister	—	—	×	—	—	—	×
,, ***compressum*** **Alb. & Schw.**	—	C	×	—	—	—	×
,, ***cinereum*** **Pers.**	×	—	—	×	—	—	×
,, ***vernum*** **Somm.**	—	C	—	—	—	—	—
,, ***gyrosum*** **Rost.**	—	—	C	—	—	—	—
,, *sinuosum* (Bull.) Weinm.	—	—	—	×	—	—	—
,, ***bogoriense*** **Racib.**	—	—	—	—	×	—	—
,, *bitectum* Lister	—	—	—	C	—	—	—
,, *contextum* Pers.	—	C	—	—	—	×	—
,, *lateritium* (Berk. & Rav.) Morg.	—	—	—	—	—	—	C
Fuligo septica **Gmel.**	—	×	×	×	×	×	×
Cienkowskia reticulata (Alb. & Schw.) Rost.	—	—	—	—	—	—	C
Craterium minutum (Leers) Fries	×	C	C	—	C	×	×
,, ***leucocephalum*** **Ditmar**	—	—	—	—	—	—	×
Leocarpus fragilis (Dicks.) Rost.	—	—	—	C	—	×	—
Diderma effusum (Schw.) Morg.	—	—	—	C	—	—	—
,, *radiatum* (L.) Lister	—	—	—	C	—	—	—
Diachæa leucopoda (Bull.) Rost.	—	—	×	C	—	—	×
Didymium difforme (Pers.) Duby	—	×	—	C	—	—	×
,, *melanospermum* (Pers.) Macbr.	—	—	—	—	—	—	×
,, *nigripes* Fries var. *xanthopus*	—	C	C	C	×	—	C
,, *squamulosum* (Alb. & Schw.) Fr.	—	C	C	C	—	—	×
Colloderma oculatum (Lippert) G. Lister	—	—	—	C	—	—	—
Stemonitis fusca Roth	—	×	—	—	×	—	×
,, ***splendens*** **Rost.**	—	×	×	C	×	—	×
,, ,, **var. *Webberi***	—	—	—	C	—	—	—
,, ,, **var. *flaccida***	—	—	—	—	—	—	×
,, ***herbatica*** **Peck**	×	—	—	×	—	—	×
,, ***ferruginea*** **Ehrenb.**	—	—	—	×	—	—	×
Comatricha nigra (Pers.) Schroet.	—	C	—	C	—	—	×
,, ,, var. *alta*	—	—	—	—	—	—	C
,, *typhoides* (Bull.) Rost.	C	—	C	C	C	—	×
,, ***irregularis*** **Rex**	—	—	—	C	—	—	—
Lamproderma echinulatum Rost.	—	—	—	—	—	×	×
,, *violaceum* (Fries) Rost.	—	—	—	—	—	×	—
Clastoderma Debaryanum **Blytt**	—	—	—	C	—	—	C
Cribraria argillacea **Pers.**	—	—	—	C	—	—	—
,, *aurantiaca* Schrad.	—	—	—	—	—	—	×
,, *intricata* Schrad.	—	—	—	—	—	—	×
Dictydium cancellatum **(Batsch) Macbr.**	—	—	—	C	C	—	×
Tubifera ferruginosa Gmelin	—	—	×	C	×	—	×
Dictydiarthalium plumbeum (Schum.) Rost.	×	—	C	C	C	—	C

TABLE OF MYCETOZOA RECORDED FROM AUSTRALIA, TASMANIA, AND NEW ZEALAND.	W. Australia	S. Australia	Victoria	New South Wales	Queensland	Tasmania	New Zealand
Reticularia Lycoperdon Bull.	—	C	—	C	—	—	×
Lycogala epidendrum (L.) Fries	—	—	—	C	—	—	×
,, ,, var. *tessellatum*	—	—	—	—	—	—	×
Trichia verrucosa Berk.	—	—	C	×	—	×	×
,, *affinis* De Bary	—	—	C	C	—	—	×
,, *persimilis* Karsten	—	—	×	C	C	—	×
,, *varia* Pers.	—	C	—	C	—	—	C
,, *decipiens* (Pers.) Macbr.	—	C	C	C	—	—	×
,, *erecta* Rex	—	—	C	C	—	—	C
,, *Botrytis* Pers.	—	C	—	C	C	×	×
,, ,, var. *cerifera*	—	—	—	C	—	—	C
,, *lateritia* Lév.	—	—	C	×	C	×	×
Hemitrichia Vesparium (Batsch) Macbr.	—	C	—	C	—	—	C
,, *clavata* (Pers.) Rost.	—	—	—	—	C	—	C
,, *Serpula* (Scop.) Rost.	—	—	—	C	—	—	×
Arcyria ferruginea Sauter	—	—	—	×	—	—	×
,, *cinerea* (Bull.) Pers.	—	—	—	C	×	—	×
,, *denudata* (L.) Sheldon	—	—	—	—	—	—	×
,, *insignis* Kalchbr. & Cooke	—	C	—	—	—	—	—
,, *incarnata* Pers.	×	—	—	—	C	—	×
,, ,, var. *fulgens*	—	—	C	C	—	—	C
,, *nutans* (Bull.) Grev.	—	C	C	—	—	—	×
,, *Œrstedtii* Rost.	—	—	—	×	—	—	—
Perchæna depressa Libert	—	—	C	—	×	—	—
,, *corticalis* (Batsch) Fries	—	C	—	C	—	×	—
Dianema corticatum Lister	—	—	—	—	C	—	—
Prototrichia metallica (Berk.) Mass.	—	—	—	—	—	×	—

usual in several respects. The sporangia are depressed, 0·7 to 1 mm. diam. on long twisted stalks, grey-brown below, yellowish above; the capillitium is almost *Badhamia*-like, and consists of a dense network of flattened threads and tubes broadly expanded at the angles, enclosing scanty deposits of yellow lime-granules; the spores are rich brown, spinulose, 10–11 μ diam. The dark spores recall those of the nearly allied *P. viride* Pers. var. *rigidum*, but the dense network of the capillitium is characteristic of *P. flavicomum*. A nearly similar form, obtained over forty years ago from Mossmans Bay, Sydney, by Whitelegge, is in the Kew Herbarium (K. 346).

P. nutans Pers. Moruya, N. S. W.—Subsp. *leucophæum*. Moruya and Blackall Mts., Q.

P. compressum Alb. & Schw. Adelaide, S. A. Sporangia clustered on dead bark.

P. vernum Somm. Adelaide. Two gatherings, one with robust sporangia on shed bark of Eucalyptus; the other, a small form on grass, closely resembling *P. cinereum* Pers., but with dark spores, 12 μ diam.

P. gyrosum Rost. Creswick, near Ballarat. A beautiful development on dead leaves.

P. bitectum Lister. Moruya, N. S. W., on dead leaves.

P. contextum Pers. Near Adelaide, S. A., on dead leaves. The orange sporangia are both clustered and free.

P. lateritium (Berk. & Rav.) Morg. Auckland, N. Z., on dead wood. The sporangia are scattered, brick-red and either smooth or scaly; the capillitium knots are yellowish with red centres.

Cienkowskia reticulata (Alb. & Schw.) Rost. Rotorua, N. Z., on dead wood. The red net-like plasmodiocarps are small but typical.

Craterium minutum (Leers.) Fries. Adelaide, S. A., and Melbourne, V.

Leocarpus fragilis (Dicks.) Rost. Sydney and Moruya, N. S. W. This species is rare in the tropics, and abundant in the Northern Hemisphere. This is the second record that I know of from the Southern Hemisphere.

Diderma effusum (Schwein.) Morg. Moruya, N. S. W., on bark. An extensive but mouldy development of net-like plasmodiocarps.

D. radiatum (L.) Lister. Moruya, N. S. W., on bark and lichen. The pale drab sporangia grouped in clusters of three to six are of the f. *umbilicatum* (Fries), with irregular dehiscence; the short stalks are nearly white, but the hypothallus is orange-red. Possibly this may have developed from red plasmodium like Dr. Rönn's specimen from Kiel, referred to in *Mycetozoa*, p. 113.

Diachæa leucopoda (Bull.) Rost. National Park, Sydney, on dead leaves.

Didymium difforme (Pers.) Duby. Moruya, N. S. W., on dead leaves.

D. squamulosum (Alb. & Schwein.) Fries. Adelaide, S. A.; Melbourne, V.; Sydney, N. S. W.; Brisbane, Q., on dead leaves.

Colloderma oculatum (Lippert) G. Lister. Moruya, N. S. W., on the bark of dead Iron-wood (*Eucalyptus sideroxylon*). A fine development of glossy brown plasmodiocarps, some of which were matured indoors from inky-grey plasmodium; the outer sporangium-wall swells up when moist to form a thick gelatinous coat; the capillitium is unusually slender and sparingly branched; the spores measure 15 μ, and are larger, rougher and darker than those of any other gathering that I have seen. It is curious that this species, first described by Lippert in 1894 from specimens developed on a culture indoors in Austria—then almost forgotten until it was found in Scotland in 1910—should now have been obtained from England, Switzerland, Portugal, Australia, Japan, and New England.

Stemonitis fusca Roth. Mamaku, N. Z.

S. splendens Rost. Enoggara, Q.; Rotorua, N. Z. The New Zealand gathering is a grand development, the closely ranked sporangia covering an area of several square inches. — Var. *Webberi* Rex. National Park for N. S. W., Sydney, on a pine stump. This specimen has such lax capillitium that it approaches var. *flaccida* Lister.

Comatricha nigra (Pers.) Schroet. Adelaide, S. A.; Moruya, N. S. W. Scanty specimens, with globose sporangia.—Var. *alta* Lister. Rotorua, N. Z.

C. typhoides (Bull.) Rost. Perth, W. A.; Ballarat, V.; Katoomba and Moruya, N. S. W.; Brisbane, Q.; very abundant.

C. irregularis Rex. Moruya, N. S. W., on dead wood. This seems to be the first record of the species outside North America.

Clastoderma Debaryanum Blytt. Moruya, N. S. W.; Rotorua, N. Z., on dead wood. The stalk in this species has an unusual structure; the upper part is slender, translucent, brown and solid; the lower part is much stouter, opaque, rugose and blackish, and encloses refuse matter; about the middle of the stalk there is usually a bright brown swollen portion, shining and rather sticky on the outside and with refuse matter inside. *Echinostelium* resembles *Clastoderma* in having a more or less tubular stalk enclosing refuse matter. In all other genera of the *Stemonitaceæ* the stalk is either solid throughout, or the lower part consists within of a close network of interlacing strands entirely free from refuse matter.

Cribraria argillacea Pers. Moruya, N. S. W.

Dictydium cancellatum (Batsch) Macbr. Moruya, N. S. W.; Blackall Mts., Q. The sporangia are both large and small, and are of the typical form.

Tubifera ferruginosa Gmel. National Park, Sydney, and Moruya, N. S. W.; Enoggara, Q.

Reticularia Lycoperdon Bull. Adelaide, S. A. A single æthalium about an inch in diameter.

Dictydiathalium plumbeum (Schum.) Rost. Ballarat, V.; Moruya, N. S. W.; Brisbane, Q.; Rotorua, N. Z. In the Australian gatherings the threads of the pseudo-capillitium are typically slender, and measure from 3 to 5 μ diam.; in the New Zealand gathering they are 6 to 7 μ thick. The spores are clay-coloured in all Mr. Cheesman's specimens.

Lycogala epidendrum (L.) Fries. Moruya, N. S. W.

Trichia affinis De Bary. Melbourne, V.; Sydney and Moruya, N. S. W.; Blackall Mts., Q.; Rotorua, N. Z.

T. persimilis Karsten. Melbourne, V.; Moruya, N. S. W.; Blackall Mts., Q.; Auckland and Rotorua, N. Z.

T. verrucosa Berk. Botanic Gardens, Melbourne, V.; Moruya, N. S. W.; Auckland, N. Z.

T. varia Pers. Adelaide, S. A.; Moruya, N. S. W.; Mamaku, N. Z.

T. erecta Rex. Melbourne, V.; Moruya, N. S. W.; Rotorua and Mamaku, N. Z. It is interesting that this species, apparently rare in most places, should be represented so abundantly in Mr. Cheesman's gatherings. The sporangia vary in colour from dark purple veined above with orange to reddish brown veined with a paler shade; the spores and elaters in all specimens are rich orange-yellow.

T. decipiens (Pers.) Macbr. Adelaide, S. A.; Ballarat, V.; Moruya, N. S. W.; Auckland and Mamaku, N. Z.

T. Botrytis Pers. Adelaide, S. A.; Moruya, N. S. W.; Enoggara, Q. Besides the typical form Mr. Cheesman has obtained two gatherings (from Moruya, N. S. W., and Mamaku,

N. Z.) of a curious variety, having the walls of the sporangium and stalk studded with deposits of a sulphur yellow waxy or resinous substance; these deposits vary in size from small scattered granules to large discoid patches, and are either embedded in blister-like pouches of the wall, or lie freely on the surface; in extreme cases they give a yellow colour to almost the whole of the stalk and sporangium-wall; they stain deep red with tincture of alkannin. I have known this variety for many years; it has been found in various parts of England, in Scotland, and in Wales. As it seems a well-marked and constant form I propose to call it var. *cerifera*. The only other species of the Mycetozoa in which wax is known to occur is *Diachæa cerifera* G. Lister; here it either forms a collar round the base of the sporangium, or is enclosed within the walls of the stalk.

T. lateritia Léveillé. Melbourne and Ballarat, V.; Sydney and Moruya, N. S. W.; Enoggara, Q.; Auckland, N. Z. In 'Mycetozoa' this is placed as a variety of *T. Botrytis*, which it closely resembles, and to which it is undoubtedly nearly allied. It differs, however, essentially in the structure of the stalk. In all forms of *T. Botrytis* the walls of the stalk are somewhat granular, and enclose a network of rugged, branching tubules containing refuse matter; the stalk is therefore more or less opaque when mounted in glycerine. In *T. lateritia* the stalk is translucent in glycerine, and consists of a closely folded bright red-brown membrane enclosing a few inconspicuous narrow strands and slender threads; sometimes a little refuse matter is enclosed at the base, and exceptionally small masses of spore-like cells occur within the folds of the stalk. We infer, therefore, that in the developing sporangium of *T. lateritia* the plasmodium ejects its refuse matter before the stalks are formed, and in *T. Botrytis* refuse matter is retained in the stalk, and is only excluded from the spore-plasm when the wall bounding the spore-cavity is laid down. Apart from the stalk characters, *T. lateritia* may be distinguished from *T. Botrytis* by the elaters being redder and having more shortly tapering ends, and by the warm orange colour of the spores; the sporangia vary in colour from red to purple-black; they are never yellowish olive in colour. The type of *T. lateritia* from Chili has been preserved; it has dull brick-red sporangia, as the name implies; the stalks are long, red and slender, and show the characteristic structure well. Possibly Fries had this abundant and widely distributed species in mind when describing *T. pyriformis* Hoffm. in *Systema Mycologicum*, iii. p. 184, but Hoffman's original description and figure (Veg. Crypt. ii. 1, t. 1, fig. 1) unquestionably refer to *Hemitrichia Vesparium*.

Hemitrichia Vesparium (Batsch) Macbr. Adelaide, S. A.; Moruya, N. S. W.; Mamaku, N. Z., typical.

H. clavata (Pers.) Rost. Blackall Mts., Q.; Mamaku, N. Z., typical.

H. Serpula (Scop.) Rost. National Park, Sydney and Moruya, N. S. W. In both these gatherings the outer walls of the

plasmodiocarps are unusually stout and dark red-brown; the capillitium and spores are orange-scarlet and very showy.

Arcyria incarnata Pers. Enoggara, Q.; Auckland, N. Z.—Var. *fulgens* Lister. Melbourne and Ballarat, V.; Moruya, N. S. W.; Rotorua, N. Z. This variety is more robust than the type, the capillitium and spores are bright crimson and the walls of the sporangial cup are firmer.

A. insignis Kalchbr. & Cooke. Adelaide, S. A. A beautiful specimen, consisting of several small clusters of pale salmon-coloured sporangia.

A. cinerea (Bull.) Pers. Moruya, N. S. W. Scattered cylindrical sporangia, weathered to a brown colour.

A. ferruginea Saut. Sydney, N. S. W.; Rotorua, N. Z.

A. nutans (Bull.) Grev. Adelaide, S. A.; Melbourne, V.; Rotorua, N. Z.; typical but rather weathered specimens.

Perichæna corticalis (Batsch.) Fries. Adelaide, S. A.; Moruya, N. S. W. The capillitium in both specimens is slender and scantily developed.

P. depressa Libert. Melbourne, V. The sporangia are much flattened; in many the dark brown outer wall has fallen away above like a lid, leaving the shining membrane enclosing the yellow spores intact. The capillitium is abundant and stouter than in British specimens, the threads being 3–4 μ diam.; they are regularly notched with shallow constrictions.

Dianema corticatum Lister. Blackall Mts., Q. A group of glossy lilac-brown plasmodiocarps on dead wood. The capillitium is fairly abundant, and shows in some parts traces of spiral thickening. This species is widely distributed in Britain; in Europe it has been obtained from Norway, Sweden, Switzerland, and Austria. It has also been found near Quebec by Mr. J. W. Eastham.

G. Lister.

NOTULÆ AD ALGAS JAPONIÆ.—II.*

By Seiitchi Narita.

Cladophora Wrightiana Harv. De-Toni, Phyc. Jap. Nov. 60; Kjellm. Marin. Chlor. Jap. 26; Okam. Alg. Jap. Exsicc. i. No. 46; *id.* Illust. Mar. Alg. Jap. t. xxix.; Matsum. Ind. Pl. Jap. i. 51.

Hab. Hamajima, Prov. Shima (*S. Narita*); Wagu, Prov. Shima (Herb. Eith High School).

C. rugulosa Mart. Tange (Preuss. Exped. N. Ost-Asien), 112, t. 2, f. 3; De-Toni, Syll. Alg. i. 306; Okam. Nippon-Sōrui-Meii, 176; *id.* Icon. Jap. Alg. ii. 103, t. lxxx., figs. 1–7; Matsum. *l. c.* 51.

Hab. Wagu, Prov. Shima (Herb. Eith High School).

Enteromorpha Linza (L.) J. Ag. Alg. Syst. vi. 134, t. 4, figs. 110–112; Hauck, Meeresalg. 427; De-Toni, Syll. Alg. i. 124;

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* Continued from Journ. Bot. 1914, 327.

id. Phyc. Jap. Nov. 58; Holmes in Journ. Linn. Soc. xxxi. 257; Okam. Nippon-Sōrui-Meii, 169; Matsum. *l. c.* 55. *Ulva Linza* L., Harv. Phyc. Brit. t. xxxix. *Phycoseris crispata* Kuetz. Sp. Alg. 476; *id.* Tab. Phyc. vi. t. 17. *P. lanceolata* Kuetz. Sp. Alg. 475; *id.* Tab. Phyc. vi. t. 17. *? P. Linza* Kuetz. Sp. Alg. 475; *id.* Tab. Phyc. vi. t. 16.

Hab. Hokkaidō (*T. Satō*); Hontō; Taiwan.

A Preliminary List of Japanese Bryopsis.

Bryopsis plumosa (Huds.) Ag. Syst. Alg. 178; Harv. Phyc. Brit. t. iii.; Hauck, Meeresalg. 471; De-Toni, Syll. Alg. i. 431; *id.* Phyc. Jap. Nov. 63; Heydr. in Hedwigia, 1894, 273; Migula, Kryptogam.-Flor. ii. 1, 865, t. xliiB, f. 5; Collins, Holden & Setchell, Phyc. Bor.-Amer. No. 227. *B. abietina* Kuetz. Sp. Alg. 462; *id.* Tab. Phyc. vi. t. 80.

Hab. Ono, Prov. Owari; Prov. Sagami, &c.

? B. corticulans Setchell in Setch. & Gardn. Alg. of North-west. America, 230; Coll., Hold. & Setch. *l. c.* No. 626. My specimen seems to have a slightly thicker frond than the authentic specimen, and the colour is light green; the other characters are identical. I, however, think that this species may be identical with *B. plumosa* (Huds.) Ag. var. *genuina* Hauck, or with its other variety or form.

Hab. Shinojima, Prov. Owari (*J. Oga & S. Narita*).

B. ambigua Okam. Nippon-Sōrui-Meii, 180. *Caulerpa ambigua* Okam. in Bot. Mag. Tokyo, 1897, No, 119, 4, i. t. ff. 3–12; Reinke, Caulerp. 42, fig. 67; Web. v. Bosse, Monogr. Caulerp. 388.

Hab. Ogasawara-jima; Nemoto, Prov. Bosiu.

I have seen only a specimen distributed in Okamura's Exsiccatæ (*l. c.*).

Caulerpa okamurai Web. v. Bosse, Okam. *op. cit.* 5, t. i. ff. 13, 14; *id.* Alg. Jap. Exsicc. n. 48; Web. v. Bosse, Monogr. Caulerp. 385, t. xxxiv. f. 9; Matsum. *l. c.* 49.

Hab. Bonin-Island (*Okamura*, &c.); Misaki, Prov. Sagami (*J. Oga*); Hamajima, Prov. Shima (*S. Narita*); Prov. Bōsiu; Prov. Kadzusa.

Forma nov. minor. Frondibus a intricatissimo surculo, rachide brevissimo, paucissime ramentaceis (per rachid. 2–7 rare pluribus disposit.); omnibus typo minoribus. Cetera ut in typo.

Hab. Hamajima, Prov. Shima (*S. Narita*).

C. Fergusoni G. Murr. in Trans. Linn. Soc. 2 S. iii. 212 (1891), t. 53, ff. 1–2; Web. v. Bosse, *l. c.* 389, t. 34, f. 12; Sved. Stud. Ceylon Caulerp. 140, f. 51; Reinke, *l. c.* 43, f. 68; Okam. Ic. Jap. Alg. iii. 119, t. cxxx. figs. 10–14.

Hab. Prov. Sagami; Nagasaki, &c.

C. anceps Harv. J. Ag. Alg. Syst. i. 9; Web. v. Bosse, Monogr. Caulerp. 281, t. 22, figs. 6–10; Okam. in Bot. Mag. Tokyo, xiii. No. 1457, 41, t. i. ff. 15–17; Yendo in *op. cit.* xvii. 153 (cum fig.);

Okam. Icon. Jap. Alg. iii. 94, t. cxxv. ff. 1–8. *C. brachypus* Harv. J. Ag. Alg. Syst. i. 11; Web. v. Bosse, *l. c.* 280, t. 22, f. 2.

Hab. Misaki, Prov. Sagami (*J. Oga*).

Halimeda Tuna Lamx., Kuetz. Sp. Alg. 504; *id.* Tab. Phyc. vii. t. 21, f. 4; Hauck, Meeresalg. 482, f. 212; Harv. Ner. Bor.-Amer. 25, t. xli., A; Okam. Nippon-Sōrui-Meii, 186; Matsum. *l. c.* 56; E. S. Barton, Halimeda, 11, t. i. ff. 1–6; Migula, Krypt.-Flor. von Deutschl. ii. 1, 862, t. xliii. f. 2.

Hab. Hamajima, Prov. Shima (*S. Narita*).

Hydroclathrus cancellatus Bory, Phyc. Austral. t. 98; *id.* Ner. Bor.-Amer. i. 120, t. ix., A; Mitchell in Phyc. Mem. ii. 53, t. xv. ff. 2–4; Kuetz. Tab. Phyc. ix. t. 52; Okam. Alg. Jap. Exsicc. i. No. 43; *id.* Nippon-Sōrui-Meii, 117; *id.* Icon. Jap. Alg. i. 18, t. iv. f. 11, t. v. ff. 7–13. *Asperococcus clathrata* J. Ag. Species, i. 75. *Encœlium clathratum* Ag., Kuetz. Sp. Alg. 552.

Hab. Wagu, Prov. Shima (Herb. Eith High School); Beppu, Prov. Bungo (*S. Narita*).

Colpomenia sinuosa Derb. & Sol., Kjellm. in Engl. Pflanzenfam. Im. 2, 203; Okam. Alg. Jap. Exsicc. i. No. 42; *id.* Nippon-Sōrui-Meii, 117; *id.* Icon. Jap. Alg. i. 86, t. xix. ff. 11–12, t. xx. ff. 10–12. Hydroclathrus sinuosus Zanard., Hauck, Meeresalg. 393, f. 171; Mitchell, *l. c.* t. xiv. ff. 1–6, xv. f. 1. *Asperococcus sinuosus* Bory, J. Ag. Species, i. 75. *Encœlium sinuosum* Ag., Kuetz. Sp. Alg. 552.

Hab. Shimmaiko, Prov. Owari (*S. Narita*); Beppu, Prov. Bungo (*S. Narita*).

Leathesia difformis (L.) Aresch. Alg. Scandinav. Exsicc. (ser. nov.) v. No. 214; Hauck, Meeresalg. 355; Okam. Alg. Jap. Exsicc. ii. No. 89; *id.* Nippon-Sōrui-Meii; De-Toni, Phyc. Jap. 54; Matsum. *l. c.* 75; Okam. Icon. Jap. Alg. i. 80, t. xviii. *Leathesia tuberiformis* Gray, Harv. Phyc. Brit. t. 324. *Leathesia marina* J. Ag. Species, i. 52; Kuetz. Sp. Alg. 543. *? Corynophora baltica* Kuetz. Tab. Phyc. viii. t. 2.

Hab. Shimmaiko, Prov. Owari (*S. Narita*); Morozaki, Prov. Owari (*Mrs. S. Takeutchi*); Shinojima, Prov. Owari (*S. Narita*); Beppu, Prov. Bungo (*S. Narita*).

Punctaria latifolia Grev. Alg. Brit. 52; Harv. Phyc. Brit. t. viii.; *id.* Ner. Bor.-Amer. i. 116; Kuetz. Tab. Phyc. vi. t. 45; Hauck, Meeresalg. 371, f. 158; J. Ag. Species, i. 73; *id.* Anal. Alg. Cont. iii. 3; De-Toni, Phyc. Jap. Nov. 56; Okam. Nippon-Sōrui-Meii, 116; Matsum. *l. c.* 79; Migula, Krypt.-Flor. B. ii. 2 Te. 201, Taf. liv., K, f. 1, Taf. liv., L, f. 1. *Phycolapathum debile* Kuetz.

Hab. Shinojima, Prov. Owari (Herb. Eith High School); Beppu, Prov. Bungo (*S. Narita*).

Endarachne Binghamiæ J. Ag. Anal. Alg. Cont. iii. 27, t. nostr. f. 5; Okam. Contents of the Alg. Jap. Exsicc. Fas. ii. No. 86 (Bot. Mag. Tokyo, vol. xvii. No. 197, 131); *id.* Icon. Jap. Alg. i. 255. *Phyllitis Fascia* Okam. Illust. Mar. Alg. Jap. t. x. (non Kuetz.): Matsum. *l. c.* 78.

Hab. Toba, Prov. Shima (*S. Narita*).

A Preliminary List of Japanese Gelidium.

Gelidium crinale (Turn.) Lamour., J. Ag. Epicr. 546; Hauck, Meeresalg. 192 (incl. var.), f. 84; Migula, *l. c.* ii. Teile 2; Coll., Hold. & Setch. Phyc. Bor. Amer. (incl. var. et form.) Nos. 195, 332, 1138; De-Toni, Syll. Alg. iv. 146. *G. corneum* var. *crinalis* J. Ag. Species, ii. 470; Martens, Die Tange, 16, 30 (nomen nudum). *Sphærococcus corneus* var. *crinalis* Ag. Syst. Alg. 227. *Fucus crinalis* Turn. Hist. Fuc. t. 198. *Acrocarpus crinalis* Kuetz. Sp. Alg. 761; *id.* Tab. Phyc. xviii. t. 33, a–c. *A. lubricus* Kuetz. Sp. Alg. 762. *A. spinescens* Kuetz. *op. cit.* 761; *id.* Tab. Phyc. xviii. t. 33. *A. corymbosus* Kuetz. *op. cit.* t. 36. *A. spathulatus* Kuetz. *op. cit.* t. 36. *Gelidium crinale spathulatum* et *nudiusculum* Ardiss. m. (ex Syll. Alg.). *G. polycladum* Sond. in Kuetz. Tab. Phyc. 14, t. 24, f. 2.

Hab. Ono, Prov. Owari.

Species nova ad floram japonicam!

G. pusillum (Stackh.) Hauck, *l. c.* 195; Okam. L. Mar. Alg. Carol. Isl. (Bot. Mag. Tokyo, 1904, 86–87); De-Toni, Syll. Alg. iv. 147; Okam. Ic. Jap. Alg. ii. 11. t. liv. ff. 10–14. *Fucus pusillus* Stackh., Turn. Hist. Fuc. t. 108. *G. corneum* var. *clavatum* Grev. Alg. Brit. 144; Harv. Phyc. Brit. t. 53, f. 6. *G. corneum* var. *cæspitosum* J. Ag. Species, ii. 740. *Sphærococcus corneus* vars. *pulvinatus*, *heterophyllus*, *clavatus* Ag. *l.c.* 227. *Acrocarpus pusillus* Kuetz. and *A. pulvinatus* Kuetz. Sp. Alg. 762; *id.* Tab. Phyc. xviii. t. 37. *G. repens* (nec Kuetz.) Okam. Jap. Alg. iii. 7, t. i. ff. 5–8 (Bot. Mag. Tokyo, xiii. No. 143, 8); *id.* Alg. Jap. Exsicc. No. 5; De-Toni, Syll. Alg. iv. 1860 (ex. diag.); Okam. Nippon-Sōrui-Meii, 21.

Hab. Prov. Ise; Prov. Sagami, &c.

G. divaricatum Martens, Die Tange, 30, Taf. viii. f. 4; De-Toni, Syll. Alg. iv. 159; Okam. Alg. Jap. Exsicc. No. 4; *id.* Illust. Mar. Alg. Jap. t. ii.

Hab. Prov. Hiuga; Prov. Ise; Prov. Shima; Prov. Owari, &c.

G. Amansii Lamour in Kuetz. Tab. Phyc. xviii. 16, t. 44; *id.* Sp. Alg. 766; Martens, *l. c.* 18; Coll., Hold. & Setch. *l. c.* No. 585; Okam. Ic. Jap. Alg. iii. 25, t. 106. *Sphærococcus cartilagineus β. setaceus* Ag. post Martens, *l. c.*

Hab. Prov. Shima (*S. Narita*); Prov. Owari (*S. Narita*), &c. Very widely distributed on the coast of the mainland, Formosa and Hokkaidō, &c.

G. pacificum Okam. Ic. Jap. Alg. iii. 99, t. 127, ff. 9–11. *G. cartilagineum* (non Grev.) De-Toni, Phyc. Jap. Nov. 21; Okam. Nippon-Sōrui-Meii, 22.

Hab. Miyake Isl.; Kodzu Isl.; Prov. Bosiu, &c.

Species mihi ignota.

G. subcostatum Okam. Nippon-Sōrui-Meii, 21; *id.* Ic. Jap. i. 233, t. xlvi.; De-Toni, Syll. Alg. iv. 156.

Hab. Prov. Shima (*S. Narita*); Prov. Sagami, &c.

G. japonicum (Harv.) Okam. Nippon-Sōrui-Meii, 21; *id.* Mar. Alg. Jap. t. xxi. *Suhria japonica* Harv., De-Toni, Phyc. Jap. Nov. 22; *id.* Syll. iv. 164; Okam. Alg. Jap. Exsicc. No. 6.

Species inquirendæ ad floram japonicam.

G. HILDENBRANDTII (Hauck) Schm. Matsum. Ind. Pl. Jap. i. 108.

G. PINNATIFIDUM (J. Ag.) Schm. Matsum. *l. c.* 108.

G. POLYCLADUM Sond.

G. ELEGANS Kuetz.

Species a genere exclusæ.

G. RIGIDUM (Vahl.) Grev. est *Gelidiopsis rigidum* Web. v. Bosse.

*ADDENDUM.

G. LINOIDES Kuetz. Tab. Phyc. xviii. t. 58, f. 1; De-Toni, Syll. Alg. iv. 159 (nomen nudum, sub speciebus inquirendis); Yendo, New Mar. Alg. Jap. i. (Bot. Mag. Tokyo, 1909).

Hab. Wagu, Prov. Shima (Herb. Eith High School); Prov. Sagami, &c.

CORRIGENDUM.

Journ. Bct. 1914, p. 325, l. 16, for "Kujiikurigahama, Prov. Boshii," and l. 19, for "Kujiikurigahama, Prov. Hitachi," read "Kujükuri-ga-hama, Prov. Kadzusa."

CYLINDROCARPUS RUGOSA Okam. Icon. Jap. Alg. i. 20, t. v. ff. 1–6; *id.* Alg. Jap. Exsicc. ii. No. 88.

Hab. From Prov. Shima to Hokkaido; Beppu, Prov. Bungo (*S. Narita*).

AMPHIROA ANCEPS Dcne., Kuetz. Sp. Alg. 702; *id.* Tab. Phyc. viii. t. 49; Yendo, Rev. Lis. Corall. 4. A. fronde angusta, pl. m. regulariter dichotoma, sub axillis geniculis fenestraformibus aut subfasciformibus.

Forma *nobilis*. *A. nobilis* Kuetz. Sp. Alg. 703; *id.* Tab. Phyc. viii. t. 51. Fronde angusta, irregulariter dichotoma aut trichotoma aut prolifera, sub axillis non geniculis aut geniculis fenestraformibus aut subfasciformibus.

Hab. Hamajima, Prov. Shima (*S. Narita*).

Forma *dilatata*. *A. dilatata* Lamx., Kuetz. Sp. Alg. 703; *id.* Tab. Phyc. viii. t. 50; Yend. Corall. veræ Jap. 12, t. i. ff. 17–21, t. v. f. 4; De-Toni, Phyc. Jap. Nov. 41. *A. galaxauroides* Sond., Kuetz. Sp. Alg.; *id.* Tab. Phyc. viii. t. 51; Mart. *l. c.* 209. Fronde latissima, pl. m. regulariter dichotoma, sub axillis geniculis fenestraformibus aut subfasciformibus raro non geniculis.

AMPHIROA EPHEDRÆA (Lamk.) Aresch. in J. Ag. Species, ii. 534; Yendo, Corall. v. Jap. 8, t. i. ff. 7–10, t. iv. ff. 5–8; *id.* Rev. Lis. Corall. 4. *A. Gaillonii* Lamx., Kuetz. Tab. Phyc. viii. t. 47. *A. Guenzii* Harv., Kuetz. Tab. Phyc. viii. t. 48.

Hab. Shinojima, Prov. Owari (*S. Narita*); Toba, Prov. Shima (*S. Narita*); Hamajima, Prov. Shima (*S. Narita*).

CORALLINA ARBORESCENS Yend. Corall. v. Jap. 25, t. iii. f. 5, t. vii. f. 7. *Jania arborescens* Yend. Rev. Lis. Corall. 39.

Hab. Shinojima, Prov. Owari (*S. Narita*).

SHORT NOTES.

Calamintha Acinos Clairville.—For several years I have been of the opinion that this plant is not the same as *C. arvensis* Lamarck, as generally considered both on the Continent and in England. I have not yet seen the original descriptions, and admit that morphologically the two are very similar, except that the flowers and calyx of *C. arvensis* are smaller, and the plant is usually annual and hence less shrubby. But I submit this preliminary note in order that field botanists may keep a look-out. What I know as *C. Acinos* is already (May 18th) in blossom on some of the carboniferous limestone cliffs and rocks about Bristol; and so it was in May, 1888–9, and again in May, 1903, on the same rocks (I have voucher specimens). Hooker (*Student's Flora*) gives July–August; Schinz and Keller (*Flore de la Suisse*) say June–August. My only British specimen of what I call *C. arvensis* was gathered by T. A. Sprague in a chalky field near Guildford on June 29th, 1904, and was even then by no means mature. I have never seen on the Continent *C. Acinos* on cliffs or rocks; but only a much smaller-flowered, less woody and probably annual plant (*C. arvensis*) in arable fields and dry ground. In fact, I do not happen to have seen the larger-flowered, shrubby *C. Acinos* except on limestone cliffs and rocks about Bristol and in Somerset. I have no descriptive "Flora" in which limestone or other cliffs and rocks are given as a habitat. Several of the French and Swiss authors give "dry fields and stony places," or "dry and arid places." Bentham says, "In waste places, or more frequently as a weed of cultivation." He evidently recognized two forms, for he says (*Handbook of British Flora*), "Corolla in the commoner variety but little longer than the calyx, although occasionally near twice as long." But Bentham calls it annual; so do Gillet et Magne (*Flore Française*). Most authors describe it as "annual or biennial," but Schinz and Keller, who call it *Satureia Acinos* (L.) Scheele, say "exceptionneliement trisannuelle." It was placed by Linnæus under *Thymus*, and alas! by O. Kuntze under *Clinopodium*. On the cliffs near Clifton it is certainly not annual, and the rootstock of even small plants is so woody that I believe many live at least several years. Mr. Bucknall has kindly shown me Spanish and Italian specimens coated with a whitish tomentum, and named *Acinos*. He also has a specimen of *C. pseudacinos* Lacaita (Agg. Fl. Princip. Citra, 1911, p. 51) from Salerno, near Naples. This has the longer flowers of the Bristol plant, but the leaves are much narrower and more erect.—H. Stuart Thompson.

Tortula atrovirens var. edentula (B. & S.).—The authors of the Bry. Europæa under *Desmatodon nervosus* described and figured a "var. *β edentulus, operculo conico breviusculo, peristomio solam membranam basilarem sistente.*" No locality is given, but the note follows:—"La var. *β* se rencontre quelque fois mélangée à la forme ordinaire, mais en général elle paraît propre aux

contrées méridionales, où la chaleur produit facilement l'avortement du péristome. Des formes intermédiaires entre le péristome réduit à la membrane basilaire et le péristome régulièrement denté se recontrent assez souvent." Paris (Ind. ed. ii.) gives the distribution of the var. as, Maritime Brittany and Normandy; South of Spain; Cape of Good Hope; ? Southern California. At the end of last year Mr. C. P. Hurst sent me for determination a moss which he had gathered on a perpendicular gravel surface on sea-coast, west of Looe, Cornwall, which proved to be this species, now known as *Tortula atrovirens* Lindb. It showed, however, a number of capsules with very short lids, and of the few de-operculate capsules most, at least, had the peristome much reduced, consisting of a basal membrane with a few fragmentary rudiments of teeth only; some of the others showing rather longer but very imperfect teeth. This appears to be the first record of var. *edentula* in Britain. I asked Mr. Hurst to obtain some better developed specimens later, and his search resulted in finding the plant in one or two other stations in the same neighbourhood. These later specimens displayed a great degree of variation in the lid and peristome—some of the capsules being quite of the normal type—and amply supported the remarks in the Bry. Eur. cited above. At the same time Mr. Hurst sent fresh specimens to the British Museum, which were kept under cultivation by Mr. W. R. Sherrin, and his observations of the ripened capsules agreed, I believe, entirely with my own experience. The var. *edentula* must therefore, I think, be looked upon as very unstable and poorly defined.—H. N. Dixon.

Anomalies in the v.-c. Divisions of Perthshire.—In Mr. Marshall's interesting paper on "Highland Plants" (pp. 158–162), I note that he queries whether *Juncus tenuis* was an inhabitant of that county twenty years ago. I found the plant myself in a road track in Glen Falloch, about three miles below Crianlarich, in 1903, eleven years before Mr. Marshall's date. It is not, however, to make this announcement that I am trespassing on your space, but to point out that Mr. Marshall, rather apologetically, includes Glen Falloch, Beinn-a-Chroin, &c., in v.-c. 88. Now, when I sent a voucher specimen of the rush to Mr. A. Bennett, he told me that it was the first record, so far as he knew, for the county of Perth, and placed it in v.-c. 87. As to the v.-c. divisions, every one will admit that H. C. Watson's map in Top. Bot. is useless for settling difficult points such as the present one, and that his descriptions also need to be revised. It is surely a strange coincidence that in the same number of the Journal two such expert field botanists as Mr. Marshall and Mr. Wheldon should be placing their Glen Falloch, Beinn-a-Chroin, &c., habitats—the first in v.-c. 88 and the second in v.-c. 87. Could not a small committee of competent British topographical botanists be invited to correspond on this subject, and to settle it definitely in any way on which they could agree, and so put an end to this awkward predicament? Even v.-c. 99 might put in a claim to Glen Falloch.—Eleonora Armitage.

CHESHIRE LICHENS.—In a paper entitled *Hepatics and Lichens of Liverpool and its Vicinity*, published in 1860, the late F. P. Marrat recorded the occurrence of the lichens *Gyrophora polyphylla* Turn. & Borr. and *Umbilicaria pustulata* Hoffm. on Bidston Hill, near Birkenhead. These lichens have not been reported from the locality in question since that time; and it was supposed by local botanists that the plants were either extinct, or that, possibly, the records were erroneous. During a recent visit to Bidston Hill, now one of the "lungs" of Birkenhead, I was happy to be able to confirm Marrat's old record by finding both *Gyrophora polyphylla* and *Umbilicaria pustulata* still existing on the hill. The specimens were fairly numerous, but small and poorly developed. The occurrence of these subalpine lichens at such a low elevation (216 ft.) in a district like the Wirral peninsula, and, still more, their persistence in the immediate neighbourhood of a huge smoky urban area like Liverpool and Birkenhead, are noteworthy facts. Along with the *Umbilicaria* was *Parmelia conspersa* Ach., another species mentioned in Marrat's list as occurring on Bidston Hill.—W. G. TRAVIS.

REVIEWS.

My Shrubs. By EDEN PHILLPOTTS. With fifty illustrations. 4to, pp. 132. John Lane. Price 10*s.* net.

MR. EDEN PHILLPOTTS, whose Dartmoor novels have obtained for him a deservedly high reputation in the realm of fiction, will hardly obtain a like recognition for his book about the shrubs he grows in his garden. In a series of chapters he enumerates these in alphabetical order, with comments that are evidently intended to be amusing, but only succeed in being silly: *how* silly, one or two extracts will show—this, for instance:—

"I ought to go to Kew in a humble spirit, and haunt its glades and glass for six months before daring to write this little book about shrubs. But I shall not. These are *my* shrubs that I am talking about, and not one of them came from Kew. I believe I have got about two that Kew has not got. If it knew of these, Kew would send messengers with rich gifts in exchange; and I should slight them and entreat them scornfully, and send them back to the Royal Gardens empty-handed. I have got *my* 'vegetable-pride' too" (p. 56).

"The real name of *M[yrtus] Luma*, by the way, is *Eugenia apiculata*, but when you have once gone to the expense of a metal label, you ignore the vagaries of science, and cleave to the old paths. After all it doesn't really matter to you what I call my shrubs, any more than it matters to me what you call your golf clubs" (p. 81).

As might be expected, Mr. Phillpotts gets a great deal of cheap amusement out of the Latin names of plants. "Imagination was needed in this matter [of giving names], but Science saw no reason to invite the co-operation of those who possessed it. She

muddled in, without the least poetic feeling for what she was about, and, as a result, a host of fine things are called after some utterly insignificant structural accident [!], while even more of them immortalise industrious nonentities with perfectly hideous names" (p. 9). This sort of nonsense recurs throughout the book: "The whole nomenclature of the world's flora is an infamy, and cries both to reason and heaven to be swept away" (p. 104): "One often in a garden longs to know what Adam called the things. He had no Greek or Latin at any rate. Perhaps, if we took children into a garden and invited them to invent names, we should get something more attractive than the atrocious words we are called upon to suffer at present" (p. 109).

It must be admitted that Mr. Phillpotts is not fettered by any regard for existing names: he writes "Amygdal*y*us" and "Amph*e*rephis" (p. 12), "Biglovia" (p. 20), "Hoher*e*a" (p. 58), "Ceonothus" (p. 126), "Hippoph*æ*" (p. 58), and the like. *Crinodendron*, he says "you may call Tricusp*a*daria, if you prefer to do so" (p. 36); *Weigela* "should be *Dievilla* by the way" (p. 121). Nor do adjectives fare better: witness "tormentosa" (pp. 81, 82) "ramentac*i*a" (p. 90), "retrursa" (p. 117). The same carelessness runs through the book: we have "La Mort*a*la" (pp. 18, 67); "Sibthorp*e*" (p. 21); "Nichol*a*s" (for Nicholson—with whose *Dictionary of Gardening* Mr. Phillpotts is evidently familiar—p. 79); "Vallambroso" (p. 49), and of course "coco*a*-nut" (p. 46). Of *Erinacea pungens* we read that "Clusius is said to have cried with exultation these words, when first he found the little pale blue beauty, 'Plant*e* nova et tota elegans'" (p. 44): Mr. William Watson of Kew is "one of the greatest of English botanists" (p. 103).

So we might continue: but enough—perhaps more than enough—has been said to show the nature of this pretentious book. Such merit as it has is to be found in the illustrations of fifty of the shrubs mentioned—we can hardly say described. These are striking rather than attractive, and are from photographs by the author: "*Koelreuteria* is a shy flowerer, but, hearing doubtless of my booklet (*sic*), it performed this year, and I photograph a spray of it accordingly" (p. 65).

A History of Botany in the United Kingdom from the Earliest Times to the End of the Nineteenth Century. By J. Reynolds Green, Sc.D., F.R.S., Fellow and Lecturer of Downing College, Cambridge. Demy 8vo, pp. xii, 648. Dent & Sons. Price 10*s.* 6*d.* net.

In this handsome and cheap volume, which he did not live to see through the press, the late Professor Reynolds Green has given an exceedingly useful and comprehensive account of botany in Britain which should be in the hands of all who wish to acquire a reasonable knowledge of the subject. We are not often inclined to adopt the estimate which publishers are accustomed to place upon the wrapper of their books as an altogether un-

prejudiced account of the contents; but in the present case this so admirably summarizes the aim of the volume that we cannot do better than reproduce it, with the addition that in our judgement the object the author had in view has been largely, though not quite completely, attained. This object, we are told, was "in the first instance, to trace the development of botany as a science from the empiricism of the herbalists, and the manner in which truly scientific conceptions came into vogue. It describes the part taken by British botanists in the development of the science generally, and narrates their activity in all its departments. It traces the course of botanical education, and shows how it made its way into the curricula of the British Universities, helped by the herb garden, the field excursion, the botanic garden and the laboratory."

For nearly thirty years Green had occupied an important position as a teacher and lecturer on plant physiology, to which he published an Introduction in 1900. His volume on *The History of Botany from 1860 to 1900*, a supplement to or continuation of Sachs's well-known work, was published in 1909, and was reviewed in this Journal for 1910 (p. 117). In the course of the notice it was remarked that the author was "naturally more at home in plant physiology" than in other branches of the subject, and one cannot but feel that the volume now before us, excellent as it is, would have been more complete as an account of "the development of the science generally" if some systematist had been associated in its compilation. "Lions,' said the king of the beasts, when he had been taken by the owner through a gallery in which his fellows were always represented as inferior to man, "would have fared better had lions been the artists," and the systematist who reads through the book or consults the index will feel himself in the position of the lion, or indeed in the even less enviable one of being ignored altogether. It may be urged that in saying this we are influenced by the fact that this Journal finds itself in the latter position, for while "in 1887 a new periodical publication bearing the honoured name of the *Kew Bulletin*"—the irregular appearance of which until the advent of Sir David Prain was perhaps unique in the history of scientific journalism—is duly recorded, the *Journal of Botany* (dating from 1863) finds no mention; but the ignoring of the excellent work which has appeared in its pages and of the British Museum and other botanists who, here and elsewhere, have made important contributions to systematic botany, justifies, if it does not demand, a protest: the names of H. N. Ridley, W. Fawcett, Spencer Moore, E. G. Baker, W. P. Hiern, are only a few that occur to one while writing—even Dr. Rendle is only referred to in connection with a physiological observation. In like manner recent British botanists and British botany are practically ignored.

The biographical notices are in the main accurate, although it is not easy to ascertain on what principle an author's work is selected for mention—*e.g.* under M. T. Masters, no reference is

made to his *Vegetable Teratology* nor to his papers on Coniferæ. It is to be regretted that the dates of birth and death, so convenient as a help to placing a man, are not given after the names. The author's comments are sometimes rather strange, and his style occasionally tends to journalese: an example of each will be found in this sentence about W. W. Newbould, which will astonish those who knew his history: "He published nothing of any value, preferring the life of a country clergyman to the exploits of the pen" (p. 515). Green has evidently (though not in this instance) made copious use of the *Biographical Index of British Botanists*, which, had he lived to write the preface, would doubtless have been acknowledged. The number of misprints in proper names which disfigure the pages may be attributed to a similar inability with regard to reading the proofs—"Muntz" for Munby (p. 434, thrice); "Neven" for Niven (p. 396, thrice); "Boot" for Boott (p. 406); "Banbury" for Bunbury (p. 551, twice); "Redoute" for Redouté (p. 270); "Loudon" for London (p. 175); "Sargent" for Sargant (p. 587)—the list might be greatly extended: all these are of course repeated in the full but not complete index, which is confined to names of persons and does not include all of these.

Here and there we note slight inaccuracies and insufficient information—*e.g.* it is stated that Ray's herbarium "contained the type species (*sic*) of his *Synopsis*" (p. 512)—this does not refer to the book on British plants usually so called but to his European collection; "the *Hand-lists* of plants cultivated at Kew" (p. 569) are stated to be "on the lines of the old *Hortus Kewensis*," which of course is not the case; the account of Sloane's herbarium (p. 154) is very incomplete—it contains no reference to the fact that this was the foundation of the National Herbarium, in which it is still preserved. There is considerable disproportion in the space allotted to the various branches of the subject—the Cryptogams are insufficiently treated—and to the biographical sketches, the paragraphing is not well done, and the writing is sometimes slipshod. But the fact that in certain respects the book might be better does not detract from its general excellence, and the favourable opinion, expressed at the beginning of this notice, of the work as a whole is not modified by the matters of detail to which we have called attention. An excellent portrait of the author faces the title-page.

BOOK-NOTES, NEWS, &c.

The *Transactions* of the British Mycological Society for the season 1914 forms the first part of vol. v. and contains practically two hundred pages. The secretary and editor, Mr. Carleton Rea, contributes reports on the spring foray held in May at Symonds Yat, and the autumn foray held in September at Doncaster: in each case a full list of the species found is given, some of which are new to science or new to this country. Miss G. Lister

supplies a list, with notes, of the Mycetozoa met with at the Doncaster meeting, and also an article on Japanese Mycetozoa which had been sent her by Mr. K. Minakata; one new species and two new varieties are described and figured, and interesting facts are given concerning the collector, gathered from his letters. The Presidential Address of Professor A. H. R. Buller on "The Fungus Lore of the Greeks and Romans" gathers together from numerous sources what is known of the quaint ideas of classical times concerning these plants, their nature and uses. Miss E. M. Wakefield continues her notes on resupinate fungi, and describes several which have recently been found in this country, including one new species. Dr. J. W. Ellis has a further contribution to his lists of new British micro-fungi, and describes one new species. Dr. Bayliss Elliott records the constant presence of fungus mycelium in the carton lining the nests of two species of British ants, the fungi being different in each case. The facts are most interesting, having regard to what is recorded of tropical ants and associated fungi. The paper is illustrated by a plate. Mr. G. K. Sutherland has an article on the Pyrenomycetous fungi which occur on marine algæ; in this practically unexplored field the author describes and figures two new genera and two new species, giving details as to what is known of their biology. Miss A. Lorrain Smith and Mr. J. Ramsbottom record new and rare British micro-fungi and describe ten new species. Mr. Ramsbottom also has papers on "Recent published results on the cytology of fungus reproduction (1914)," "The generic name Protascus," "Guttulæ in Spores of Discomycetes"; also obituary notices of Dr. M. C. Cooke (a shortened form of which appeared in this Journal) and the Rev. W. L. W. Eyre. The former notice is illustrated by a photograph taken in 1895 of a small group of mycologists to whom the foundation of the Society is due; and the latter by a group taken at the foray at Haslemere in 1905 which shows many of the past presidents of the Society. The get-up of the publication reaches its usual high standard, and the range of the contributions and the increasing membership are a sign of the energy of the secretary and editor. With the low subscription (ten shillings) and the increased interest in the study of mycology, the Society is certain to extend its activities. The President for next year is Mrs. Rea, well-known for her paintings of fungi. The spring foray was held at Baslow at Whitsun; the autumn foray will take place from September 27th to October 2nd, either at Swansea or Sidmouth.

At the meeting of the Linnean Society on June 3rd, 1915, Mr. Horace W. Monckton communicated a note on the Plant-association at the foot of the Boium Glacier, Norway. The Boium is one of the larger glaciers which descends from the great Jostedals snow-field. It flows down into a head-valley of the Fjaerlandsfjord, and the foot of the ice is 492 ft. above the sea. The latitude is between 61° and 62°, that is, a little north of the Shetlands. At the foot of the ice there is the usual desolate space with fresh moraine, and plants are gradually finding

their way on to this ground. In places where the ice has advanced a little, plants may be found growing and flowering close to the glacier itself. Among the plants thus creeping on to the moraine were noticed a combination of mountain and valley forms: of mountain plants there were *Salix herbacea*, *Saxifraga stellaris*, and *Phyllodoce cærulea*; and of forms of general distribution which one does not usually associate with glaciers there were *Alchemilla alpina*, *Trientalis europæa*, *Pyrola minor*, *Pinguicula vulgaris*, *Phegopteris Dryopteris*, *Lotus corniculatus*, *Sagina procumbens*, and a species of *Epilobium*. At the same meeting Dr. Otto Stapf showed various illustrations of the celebrated Dragon Tree at Orotava, and especially a drawing by Don Augustin Monteverde, dating from the earlier months of 1819, before the tree was partially destroyed by a gale on July 21st, in that year. This drawing is the property of Dr. Perez of Orotava, who had sent it to Kew for comparison with other illustrations. Dr. Stapf discussed the known history of the Dragon Tree of the Canaries and notices of it from early writers, referring *inter alia* to the resinous product known as "Dragon's Blood," formerly used as a pigment and in medicine, but now almost restricted to colouring varnishes.

Messrs. Horne & Son of Whitby have published in a neat little shilling volume an account of *Whitby Wild Flowers*, by Mr. Bernard Reynolds, which is described on the title-page as "a complete botanic list of the flowers, grasses, and ferns of the Whitby district (including Levisham and Scarborough), with notes on their history and habitats." The list, which is by no means critical, indicates the plants of thirty specified localities: it is followed by somewhat discursive notes upon plants and places, and indeed upon more general matters—*e. g.* Mr. Reynolds thinks that "not even the barbarous blasting of bleeding Belgium can quite equal" the bombardment of Whitby. The little book will doubtless be useful to visitors to Whitby, but it can hardly be regarded as a serious addition to our list of local Floras.

Under the title *Junior Botany* (University Tutorial Press, sm. 8vo, pp. xii, 288, 141 text figs., price 2*s.* 6*d.*) Dr. Cavers has achieved a useful little text-book, based on the syllabuses of the Oxford and Cambridge Junior Local Examinations in Botany. The first sixty-six pages are devoted to an introductory course in physics and chemistry, and contain an account of the nature and composition of air and water, and various other chemical and physical matters, without a knowledge of which it is impossible to understand the physiology of plant-life. The point of view of the botanical portion of the book is mainly physiological, but a concluding chapter is assigned to a brief account of about a dozen of the commoner families of flowering plants. The spelling "andrecium," "gynecium," is, we presume, on the analogy of "ecology." The book is avowedly a guide to the practical study of plant-life, and contains instructions for experiments, many of which can be carried out without the aid of expensive apparatus.

(ANNUAL SUBSCRIPTION 16s. POST FREE.)

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THE

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BRITISH AND FOREIGN

EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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THE JOURNAL OF BOTANY was established in 1863 by Dr. Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of general Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains. In 1896 it became necessary to increase the size of the Journal, owing to the number of papers sent for publication: the number of plates was at the same time augmented.

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A REVISION OF SALMEA AND SOME ALLIED GENERA.

By S. F. Blake, A.M.

(Concluded from p. 202.)

1. N. HIRSUTA (Sw.) Urb. Scandent shrub, up to 10 m. high, slender, grey-barked, glabrate below, softly pilose-tomentulose above with dull whitish hairs; the main stem (*fide* Harris in sched.) "several inches in diameter, with a corky bark." Leaves ovate to ovate-lanceolate, long-acuminate, at base subcordate to rounded, minutely appressed-serrulate, penninerved, above green, minutely pilosulose to short hispid-pilose (then the hairs tuberculate-based), beneath densely softly canescent-pilose-tomentose, 7–9·5 cm. long, 1·8–4·5 cm. wide, on petioles 5–12 mm. long. Heads odorous (*fide* Harris), rather numerous, in terminal and axillary cymose panicles, the pedicels 0·5–3 mm. long. Disk 6– (fruit) 10 mm. high. Involucre 4 mm. high, sub-4-seriate, the phyllaries graduated, oblong, the outer obtuse, the inner gradually acutish, pale, subindurated, barely herbaceous below apex, appressed-pilosulose and glandular-dotted. Corollas 4·5 mm. long, ampliated at extreme base, the throat funnel-form. Pales laterally 1-toothed, pubescent above. Achenes linear-oblong, blackish, sparsely puberulous at apex, 4·5 mm. long; awns decidedly unequal, up to 2 mm. long, ciliate, the inner or often both broadly winged.—*Bidens hirsuta* Sw.! Prod. 110 (1788). *Salmea hirsuta* (Sw.) DC. Cat. Hort. Monsp. 141 (1813); Griseb. Fl. Br. W. Ind. 375 (1861). *Hopkirkia hirsuta* (Sw.) Spreng. Sys. iii. 444 (1826). *Eupatorium vestitum* Spreng. *l. c.* 416 (1826). *Notoptera hirsuta* (Sw.) Urb. *l. c.* 466 (1901), incl. var. *Eggersii* Urb. *l. c.* (based on *Eggers*, 3458).—JAMAICA: *R. Shakespear*, *Wm. Wright*, *Swartz* (Brit. Mus.!), *Alexander*, *Wilson*, *Mac Fadyen*, *Harris*, 8427, 10,062, 10,158, 11,682. Ascends to 305 m. (*Harris*, 8427). Urban's var. *Eggersii*, based on forms with leaves rounded not cordate at base, does not seem distinct enough to merit varietal rank.

2. N. GUATEMALENSIS Urb. *l. c.* 465 (1901). This insufficiently described species is related to the last, from which it "præter alias notas præsertim foliis apice obtusis vel acutiusculis (nec longe acuminatis) discrepat. Guatemala: Friedrichsthal." Not seen; possibly identical with the next.

3. N. GAUMERI Greenm. Field Col. Mus. Bot. ii. 269 (1907). *Salmea Gaumeri* Greenm. Field Col. Mus. Bot. iii. 124, with fig. (1904). Not seen, but from description and figure easily distinguished from *N. hirsuta* by the elliptic-ovate obtuse or rounded leaves. Based on *Gaumer*, 977, from Izamal, Yucatan, described as a "shrub, 20 feet high," with "flowers white, very aromatic." *Schott*, 755 (Brit. Mus.), from near Hacienda Chucá, Yucatan, is referred with some doubt to this species.

Sect. 2. **Loxosiphon**, n. sect. Capitula discoidea turbinato-hemisphærica. Clinium conicum. Corollæ valde recurvatæ. Alæ

achenii glabræ. Antheræ basi obtuse cordato-sagittatæ. Rami styli obtusi. Type, *Salmea curviflora* R. Br.—Southern Mexico and Central America.

4. N. CURVIFLORA (R. Br.), n. comb. Branching shrub (perhaps scandent?), with striatulate greyish stem, glabrate below, hispidulous-pilosulose above. Leaves ovate, long-acuminate, at base broadly rounded, very obscurely crenate-denticulate, tripli-quintuplinerved, above dark green, sparsely tuberculate-strigillose, beneath scarcely paler, evenly but not densely hispidulous-strigillose or tuberculate-strigillose, glandular-dotted, 7·5–11·8 cm. long, 3·5–4·8 cm. wide. Petioles immarginate, tuberculate-strigillose, 4–7 mm. long. Heads numerous, cymose-paniculate at end of stem and on widely spreading axillary branches, forming a pyramidal panicle 2·2 dm. long, 2 dm. wide (when well developed). Pedicels mostly 5–9 mm. long. Disk (in fruit) 7 mm. high, 8–9 mm. thick. Involucre 2-sub-3-seriate, 3·5 mm. high, graduated, the outer phyllaries ovate, the inner ovate-oblong to ovate-lanceolate, acutish or the outer obtusish, slightly ribbed, 1-nerved, subindurated, sparsely sordid-puberulous. Corollas abruptly reflexed near apex of tube, with funnel-form throat and ovate-lanceolate teeth, 3·6 mm. long (throat 1·6 mm., teeth 1 mm., tube 2 mm.). Pales firm, indurated, carinate, with ± recurved abruptly acute apex, sparsely puberulous on back, 4 mm. long. Achenes brownish-black, oblong-obovate, glabrous, 2·8 mm. long; awns very unequal, the inner or sometimes both with a broad wing decurrent on sides of achene.—*Salmea ? curviflora* R. Br.! Trans. Linn. Soc. xii. 112 (1817). *Otopappus curviflorus* (R. Br.) Hemsl. Biol. Centr. Am. Bot. ii. 191 (1881), as to syn., and specim. in part.—NICARAGUA: Chontales, 1867–68, *Tate*, 251 (Brit. Mus., Kew); without definite locality, *Seemann*, 98 (Brit. Mus., Kew). CULT.: Herb. Miller (type, Brit. Mus.). This species has been confused by authors with the two following, although chiefly with the next species Hemsley's *Otopappus curviflorus* included all three.

5. **N. scabridula,** n. sp. Frutex scandens. Caulis tenuis striatulus cortice cano tectus deorsum glabratus supra subdense molliter puberulo-pilosulus in inflorescentia sordide pilosus pilis flexuosis patentibus et ± glandulosus. Folia ovata ad oblongo-ovata acuminata basi rotundata aut truncato-rotundata obscure serrulata (dentibus parvis mucronatis patentibus vel depressis ca. 16-jugis) penninervia vel subtriplinervia supra scabridula pilis minutis subpatentibus basi tuberculatis rugulosa impresso-nervia subtus obscure canescenter dense pilosula pilis patentibus glanduloso-adspersa venoso-reticulata 5–9 cm. longa 1·7–3·9 cm. lata. Petioli immarginati dense molliter puberulo-pilosi 6·5–10 mm. longi. Capitula turbinato-hemisphærica ad apicem caulis cymoso-paniculata (ca. 20–30) in pedunculis axillaribus et terminalibus 3–8-cephalis paniculam apertam 5–10 cm. longam 5–10 cm. latam efficientia. Pedicelli sæpius 4–10 mm. longi. Discus 4–5 mm. altus 5–6 mm. crassus. Involucri 3-seriati gradati 2·5 mm. alti squamæ appressæ induratæ 1-vittato-subcarinatæ exteriores ovato-oblongæ interiores oblongæ ad oblongo-lanceolatæ obtusæ sæpius

mucronulatæ ± ciliolatæ. Corollæ disci albidæ supra medium abrupte reflexæ tubo basi abrupte ampliato faucibus infundibuliformibus ad 3 mm. longæ (tubo 1·5 mm., faucibus 1·5 mm. [dentibus 0·7 mm. longis inclusis]). Paleæ induratæ carinatæ supra puberulæ apice acuminato abrupte patente vel reflexo 3 mm. longæ. Achenia nigro-brunnea oblongo-obovata striata glabra 2 mm. longa. Aristæ pappi 2 valde inæquales 0·7–1·5 mm. longæ interiore ad alam achenii adnata.—*Otopappus curviflorus* auctt., pro parte.—VERA CRUZ: Mirador, February, 1839, *Linden*, 1165 (Kew); savannas near Vera Cruz, Cordillera, alt. 915 m., 1840, *Galeotti*, 2214 (Kew); Mirador, November, 1841, *Liebmann*, 388 (Kew); "liane," Valley of Cordova, May 14th, 1866, *Bourgeau*, 2034 (Kew); Atoyac, November, 1882, *Kerber*, 131 (type coll.: Brit. Mus., Kew). HONDURAS: San Pedro Sula, Dept. Santa Barbara, alt. 183 m., February, 1889, *Thieme* (J. D. Sm. distr. 5313, Kew).—This and not the last is apparently the true *Zexmenia salmeoides* Sch. Bip. (ex Benth. & Hook. Gen. Pl. ii. 381 (1873), as syn. *Salmea curviflora* R. Br.), since Liebmann's specimen at Kew is so labelled.

6. N. BREVIPES (Rob.), n. comb. Slender shrub (scandent?) with greyish bark, the stem striate, glabrate below, pilosulous with tangled sordid hairs above. Leaves ovate or almost ovate-lanceolate, acuminate, cuneate or rounded-cuneate at base, regularly serrulate with ca. 19–27 pairs of minute mucronate spreading teeth, pinni- or subtriplinerved, dark green above, impressed-nerved, slightly harsh with tuberculate strigillosity, beneath dull grey with dense rather soft short spreading hairs intermixed with sessile glands, reticulate-venose, 6·5–10 cm. long, 2·3–3·7 cm. wide, on slender marginless densely short-pubescent petioles 1·1–1·8 cm. long. Heads numerous in 5–13-flowered axillary and terminal spiciform cymose-racemose panicles, shorter than the leaves, 3–5·5 cm. long, about 1·5–3 cm. wide. Disk 5–6 mm. high, 6–8·5 mm. wide. Involucre sub-3-seriate, 3·5 mm. high, its phyllaries graduated, indurated, ± 1-vittate-costate, obtusish to subacute at the ± ciliolate apex, the outer ovate or ovate-oblong, the inner oblong or lance-oblong. Corollas abruptly reflexed below the middle, the tube abruptly ampliated at base, the throat campanulate, with triangular-lanceolate teeth, 4 mm. long (throat 1·9 mm. (teeth 0·7 mm.), tube 2·1 mm.). Pales indurated, sparsely ciliolate near tip, the acute or acuminate apex usually ± reflexed, 3·7 mm. long. Achenes (submature) brownish, about 3-striate each side, glabrous, 2 mm. long. Pappus-awns 2, very unequal, 0·5–1·8 mm. long, the inner with a broad wing decurrent on the achene.—*Otopappus curviflorus* (R. Br.) Hemsl., *l. c.*, as to specimens in part. *O. brevipes* Rob.! Proc. Am. Acad. xliv. 621 (1909).—CHIAPAS: 1864–70, *Ghiesbreght*, 541 (type coll.: Brit. Mus.). GUATEMALA: Volcan de Fuego, alt. 1982 m., December, 1873, *Salvin* (Kew).

Sect. 3. **Perigyne,** n. sect. Capitula radiata hemisphærica. Clinium convexiusculum. Corollæ disci erectæ flavæ; eæ radii flavæ ligulatæ parvæ steriles discum superantes. Achenia in-

æqualiter 2-aristata 2-alata ala exteriore angustissima interiore latiore obliqua ambabus cum aristis confluentibus. Antheræ basi obtuse sagittatæ. Styli rami acuti vix appendiculati hirtelli.—Type, *Zexmenia* (*Otopappus*) *tequilana* Gray.—Southern Mexico.

7. N. TEQUILANA (Gray), n. comb. Shrub 1·6–2·3 m. high, branched in the inflorescence, the stem greenish, striatulate, tuberculate-strigillose to -strigose. Leaves ovate to ovate-lanceolate, long-acuminate, truncate-rounded to slightly cordate at base, regularly serrulate with small mostly appressed teeth, tripli-quintuplinerved, above green, rugulose and ± impressed-venose, tuberculate-strigillose to -strigose, beneath scarcely paler, gland-dotted, ± reticulate-venose, from strigillose chiefly along the veins to rather softly and densely hispidulous-pilosulous with spreading hairs, 8–13 cm. long, 2·8–7 cm. wide, on tuberculate-strigillose or -strigose marginless petioles 6–22 mm. long. Heads 1–1·6 cm. wide, rather numerous in axillary and terminal 3–15-flowered ternately arranged cymose panicles, on peduncles 2·5–4·8 cm. long, shorter than the leaves; pedicels naked or bracteolate, tuberculate-strigillose to hispid-pilose, 3–18 mm. long. Disk hemispheric, 6·5-8 mm. long, 12 mm. wide. Involucre 4-sub-5-seriate, regularly graduated, 3·5–4 mm. high; phyllaries canescent-strigose, oblong, indurated and chartaceous-coriaceous below, all but the innermost with a short acutish to obtuse spreading herbaceous apex, the outermost chiefly herbaceous. Rays about 20, styliferous but sterile, oval-oblong, yellow, emarginate, 4 mm. long, 1·3 mm. wide. Disk-corollas yellow, glabrous, 4 mm. long (tube 0·8 mm.). Pales very narrow, spinulose on the narrow keel and acutish apex, 6 mm. long. Achenes obovate, very narrowly winged on the outer, broadly and obliquely on the inner angle, the wings adnate to the very unequal pappus awns. Squamellaceous corona none.

SOUTH MEXICO; variable. Divisible into two not strongly marked varieties:—

Var. GENUINA, n. var. Foliis infra sparse hispidulo-strigillosis supra tuberculato-strigillosis; caule tuberculato-strigilloso. — *Zexmenia* (*Otopappus*) *tequilana* Gray! in Wats. Proc. Am. Acad. xxii. 425 (1887), pro parte (as to *Palmer*, 359). *Otopappus tequilanus* (Gray) Rob. Proc. Am. Acad. xliv. 622 (1909).—JALISCO: in ravines and along hillsides, Tequila, 1886, *Palmer*, 359 (cotype coll.: Brit. Mus., Kew); mountains above Etzatlan, October 22nd, 1903, *Pringle*, 11555 (Kew).

Var. ACUMINATA (Wats.), n. comb. Foliis infra dense sub-molliter hispidulo-pilosulis supra tuberculato-strigosis; caule strigoso-piloso pilis basi vix tuberculatis.—*Zexmenia* (*Otopappus*) *tequilana* Gray, *l. c.*, pro parte (as to *Palmer*, 394). *Otopappus acuminatus* Wats. Proc. Am. Acad. xxvi. 140 (1891). *O. tequilanus* (Gray) Rob. var. *acuminatus* (Wats.) Rob. *l. c.* xliv. 622 (1909).—JALISCO: ravines and hillsides, Tequila, 1886, *Palmer*, 394 (cotype coll. of *Z. tequilana*: Brit. Mus., Kew); Bolaños, September 10th–19th, 1907, *Rose*, 2927 (Kew). *Pringle*, 3837 (slopes of barranca near

Guadalajara, Jalisco, September 11th, 1891 (Brit. Mus., Kew)) is intermediate but nearer var. *acuminata*. Watson's type (same locality, October, 1889, *Pringle*, 2999) has not been examined.

8. N. EPALEACEA (Hemsl.), n. comb. Shrub with slender subterete greyish-brown densely tuberculate-strigillose stem. Leaves broadly to narrowly ovate, acute to long-acuminate, truncate to rounded-truncate at base, serrate with very depressed strongly mucronate teeth, green both sides, very harshly tuberculate-strigillose or -hispidulous above, beneath strongly reticulate, harshly hispidulous along the venation and sparsely gland-dotted, triplinerved, 6–9·7 cm. long, 2–4·5 cm. wide, on tuberculate-strigillose marginless petioles 1·2–2 cm. long. Heads three to eight, 2·2 cm. wide, on axillary and terminal naked monocephalous tuberculate-strigillose peduncles 0·8–4·5 cm. long, much shorter than the leaves. Disk 1·1–1·2 cm. high, 1·2–1·5 cm. wide. Involucre 5-sub-6-seriate, graduated, 8 mm. high, the outermost phyllaries oblong-spatulate, acutish, strigillose, herbaceous throughout or indurated at the extreme base, the tips loose; next two series gradually longer, ovate, densely strigillose, strongly indurated, chartaceous-coriaceous, with darker scarious margin and abrupt short mucronate spreading herbaceous tip; the others gradually longer, oblong, acutish, like the last but without herbaceous tip, passing gradually into the outermost pales. Rays about 38, pale yellow, sterile, with short included style, oblong, emarginate, 4·5 mm. long, 1·3 mm. wide. Disk corollas yellow, glabrous, 4·2 mm. long (tube 1·2 mm.), the throat slender-funnel-form. Pales extremely narrow, acutish, denticulate-spinulose above, 8 mm. long. Achenes brownish-black, slightly costate, obovate-oblong, 3 mm. long, on the outer angle with an awn 0·6 mm. long, not winged, on the inner broadly winged above, the wing adnate to the 1·8 mm. long awn.—*Otopappus epaleaceus* Hemsl.! Biol. Centr. Am. Bot. ii. 191 (1881). — MORELOS: lava-fields near Xantepec, alt. 1372 m., October 3rd, 1902, *Pringle*, 8731 (Brit. Mus., Kew). Mexico, without locality, 1846, *Baites*, 7 (type: Kew).

IV. OTOPAPPUS Benth.

Heads homogamous or heterogamous, the disk flowers hermaphrodite, fertile, the rays when present fertile. Involucre 3-6-seriate, graduated, usually with a few foliaceous bractlets at base, the phyllaries indurated, ± striate, the outer often herbaceous-tipped, obtuse or sometimes acute, ± strigillose. Receptacle flattish to slightly convex. Pales rather narrow, persistent, folded about the achenes. Rays none or present and ligulate, fertile, yellow, narrowly oblong, about 10-18. Disk corollas yellow, numerous, with slender tube nearly equalling the cylindric throat, 5-toothed. Anthers sagittate at base, the apical appendages lanceolate to ovate. Style-branches of ray linear, obtusish, not papillose; of disk linear, elongated, acutish, scarcely appendaged, papillose-hirtous. Achenes strongly compressed, oblong or obovate-oblong, glabrous, unequally 2-awned, 2-winged, the wings obliquely united to the awns, the inner much broader and

longer; awns united to the paleaceous corona, composed of ca. 6 denticulate to lacerate squamellæ united nearly to apex into a cup, not contracted at base. — Opposite-leaved shrubs with yellow often radiate heads. Leaves penninerved, triplinerved, or 3-nerved, acuminate, obscurely or obviously dentate, petioled. Heads rather small to medium, in few-several-headed axillary and terminal cymose panicles.—*Otopappus* Benth. in B. & H. Gen. Pl. ii. 380, no. 408 (1873); in Hook. Ic. xii. 47, t. 1153 (1873); Hemsl. Biol. Centr. Am. Bot. ii. 191, t. 49 (1881). *Zexmenia* Llav. sect. *Otopappus* (Benth.) O. Hoffm. in Engl. & Prantl, Pflanzenfam. iv. pt. 5, 238, f. 116*o* (1890).

Key to Species.

Leaves oblong-ovate, cuneate to rounded at base, mostly 3-nerved, merely strigose or strigillose both sides, smooth above.
- Leaves usually distinctly repand-dentate; pedicels mostly 1–2 cm. long ..... 1. *verbesinoides.*
- Leaves minutely appressed-serrulate; pedicels mostly 2–7 mm. long ..... 2. *trinervis.*

Leaves ovate to oblong-ovate, truncate to subcordate at base, mostly merely triplinerved, tuberculate-strigose and very scabrous at least above, except in No. 8.
- Heads radiate.
  - Leaves merely strigillose along the veins beneath 3. *microcephalus.*
  - Leaves densely spreading-hispidulous beneath 4. *Pringlei.*
- Heads discoid.
  - Leaves densely pubescent beneath.
    - Leaves 3–5·5 cm. long ..... 5. *xanthocarphus.*
    - Leaves 6·5–17 cm. long.
      - Involucre 3 mm. high ..... 6. *syncephalus.*
      - Involucre 6–7 mm. high ..... 7. *robustus.*
  - Leaves merely pilosulous along veins beneath 8. *glabratus.*

1. O. VERBESINOIDES Benth. in Hook. Ic. xii. 47, t. 1153 (1873). Branching, straggling or scandent shrub, the stem slender, greenish or brownish, striate, strigose or strigillose, at length glabrate below. Leaves oblong or oblong-ovate, acuminate to long-acuminate, cuneate-rounded at base, shallowly subremotely repand-dentate or sometimes merely denticulate, 3- or sometimes merely triplinerved, green both sides, shiny above, sparsely appressed-strigose and -strigillose both sides, the hairs not tuberculate-based, 8–18 cm. long, 2–6·3 cm. wide, on scarcely margined strigose petioles 4–9 mm. long. Heads cymose-panicled in 1's–5's on terminal and axillary strigillose or pilosulous peduncles usually much shorter than the leaves, the slender pedicels mostly 1–2 cm. long; heads 1·5–2·3 cm. wide. Disk turbinate-hemispheric,

9–11 mm. high, 1·2–1·7 cm. wide. Involucre 5-sub-6-seriate, graduated, the innermost phyllaries 4·5–5 mm. high; phyllaries indurated, scarcely striate, pale, chartaceous-subcoriaceous, the outer ovate, the inner oblong, all ± strigillose, the inner very narrowly scarious margined, 1–5-vittate, the 1–2 outer series with a 1-ribbed spatulate to linear mucronate herbaceous tip which often exceeds the disk, the others abruptly acute, unappendaged. Rays about 10, yellow, linear-oblong or linear, emarginate or 3-denticulate, 5–9 mm. long, 1·2 mm. wide. Disk corollas ± abruptly reflexed at maturity, glabrous, 5 mm. long (tube 1·2 mm., teeth 0·6 mm.). Pales narrow, acute, glabrous, 7·5 mm. long. Achenes obovate-oblong, brownish, 3·7 mm. long, very narrowly or scarcely winged on the outer angle, broadly and obliquely above on the inner, the wing coalescent with the awn, the paleaceous corona lacerate, 1·3 mm. high.—Greenm. Field Col. Mus. Bot. ii. 270 (1907). *Perymenium Sartori* Sch. Bip. ex Klatt, Leopold. xxiii. 144 (1887), as syn.—GUATEMALA: Pansamalá, Dept. Alta Verapaz, alt. 1158 m., January, 1887, *Türckheim*, 1110 (Kew); Rio Chiquito, Dept. Santa Rosa, alt. 700 m., September, 1893, *Heyde & Lux*, 6174 (Brit. Mus., Kew). NICARAGUA: "straggling shrub, flowers yellow," Chontales, *Seemann*, 106 (cotypes: Brit. Mus., Kew); Chontales, 1867–68, *Tate*, 145 (cotype: Kew). COSTA RICA: "liane," thickets, Las Vueltas, San José, alt. 635 m., December, 1898, *Tonduz*, 12,739 (Brit. Mus., Kew); without definite locality, *Endres*, 90 (Kew). Reported also by Greenman from Vera Cruz, Chiapas, and Campeche.

2. **O. trinervis,** n. sp. Frutex ramosus. Caulis tenuis subteres vix striatulus canus supra et in inflorescentia dense strigillosus infra glabratus. Folia opposita oblongo-ovata vel ovato-lanceolata longe acuminata basi truncato-rotundata obscure serrulata (dentibus ca. 11–16-jugis minutis) valde 3-nervia et penninervia supra obscure viridia sparse (costam secundum dense) strigillosa pilis basi non tuberculatis subtus vix pallidiora subdense strigillosa pilis arcte appressis basi sublepidotis non tuberculatis 7–11 cm. longa 2–3 cm. lata. Petioli strigillosi vix marginati 4–5 mm. longi. Capitula per speciem discoidea vix numerosa in paniculis cymosis 3–5-cephalis axillaribus et terminalibus quam folia multo brevioribus disposita in pedunculis dense strigillosis 8-35 mm. longis. Pedicelli dense strigillosi sæpius 2–7 mm. longi. Discus 6·5–7·5 mm. altus 10·5–11·5 mm. dimetente. Receptaculum convexiusculum ca. 52-florum. Involucri 5-seriati gradati 3·5–4·5 mm. alti (squamis extimis sæpe elongatis exclusis) squamæ valde induratæ vix striatæ ovatæ ad oblongo-ovatæ eæ serierum 2 exteriarum appendicibus spathulatis foliaceis patentibus quam discus brevioribus; interiores breviter patenti-subherbaceo-apiculatæ; intimæ omnino non herbaceæ appressæ abrupte subacutæ. Radii per speciem carentes. Corollæ disci glabræ ad 3·5 mm. longæ. Paleæ angustæ dorso subcarinatæ in apice acuto colorato patenti-reflexo sparse strigillosæ 6 mm. longæ. Achenia nigra oblonga striata 3·5 mm. longa. Pappus cyathiformis lacerato-fimbriatus cum ala exteriore brevi angustissime et interiore 1·6 mm. longa

multo latiore conjunctus 0·5 mm. altus.—Chiapas: Finca Irlanda, September, 1913, *Purpus*, 6678 (Brit. Mus.). Distributed as *O. brevipes* Rob.

3. **O. microcephalus**, n. sp. Frutex ramosus 3·3 m. altus. Caulis ramique tenues striatuli tuberculato-strigillosi demum infra glabrati. Internodia 3–6·5 cm. longa. Folia ovata acuminata mucronata basi truncato-rotundata denticulata (dentibus ca. 12–16-jugis depressis mucronulatis) triplinervia et penninervia subtenuia utrinque viridia supra scaberrime tuberculato-hispidula pilis incurvis subtus glanduloso-adspersa et venas et venulas secundum hispidulo-strigillosa pilis basi subtuberculatis 4·7–8·9 cm. longa 1·7–3·7 cm. lata. Petioli strigillosi immarginati 4·7 mm. longi. Capitula (anthesi) 6·5–8 mm. lata in paniculis cymosis 3–5-cephalis axillaribus et terminalibus disposita (ca. 8–24 ad apices ramorum). Pedunculi 1–2·8 cm. longi quam folia breviores; pedicelli 2–14 mm. longi strigillosi. Discus 5·5– (fructu) 8 mm. altus 4– (fructu) 8 mm. dimetente. Receptaculum convexiusculum. Involucri 4-seriati gradati 3·5 mm. alti squamæ oblongo-ovatæ obtusæ valde induratæ chartaceo-coriaceæ strigillosæ apice (eis seriei intimæ exceptis) appendice parva herbacea patente vel reflexa prædita. Radii ca. 8 flavi oblongi 2 mm. longi 0·6 mm. lati. Corollæ disci ca. 32 flavæ glabræ 3·5 mm. longæ (tubo 1·3 mm.). Paleæ firmæ angustæ acutæ ad apicem hispidulæ 5·5 mm. longæ. Achenia (immatura) pallide brunnea 2 mm. longa in angula interiore e medio pæne ad apicem aristæ (2·3 mm. longæ) late alata in angula exteriore angustissime alata vix distincte aristata; corona paleacea cyathiformis profunde lacerata cum alis connata.—Colima: bank of creek, opposite side of bay from Manzanillo, December, 1890, *Palmer*, 1022 (Brit. Mus., Kew). Distributed as *Zexmenia tequilana* Gray, and recorded (Rose, Contr. U. S. Nat. Herb. i. 335 (1895)) under that name.

4. **O. Pringlei** (Greenm.), n. sp. Frutex ramosus. Caulis tomentoso-puberulus demum glabratus cortice cano-brunneo tectus; rami patentes foliosi striatuli dense tomentoso-pilosuli pilis patentibus vel laxe retrorsis, in inflorescentia paullo asperi-cribus subhispido pilosis. Internodia (ramorum) 2–4·5 cm. longa. Folia ovata acuta vix acuminata mucronata basi truncata vel truncato-rotundata dentata (dentibus ca. 23–29-jugis triangularibus mucronulatis subæqualibus subpatentibus) triplinervia supra viridia densissime scaberrime tuberculato-hispidula (pilis patenti-bus vel adflexis) rugulosa impresso-venosa subtus paullo pallidiora reticulata glanduloso-punctata et subscabre patenti-hispidula 4·6–6·7 cm. longa 2·5–3·6 cm. lata. Petioli immarginati scaberrime hispidi 6·5–12 mm. longi. Capitula 1·2 cm. lata hemisphærica in apicibus ramorum 5–7 candelabriformiter umbellato-cymoso-pani-culata in pedunculis monocephalis nudis vel bracteolatis dense hispidulo-pilosulis 7–26 mm. longis. Discus 9 mm. altus 12 mm. dimetente. Involucri 4-sub-5-seriati gradati 4·5–5·5 mm. alti squamæ oblongæ obtusæ chartaceo-coriaceæ induratæ pallidæ apice appendice brevi subspathulato-ovali læte viridi patente vel reflexa tuberculato-hispidula prædita strigosæ; extimæ maxima

ex parte herbaceæ. Radii ca. 20 pallide flavi oblongo-ovales 1·8 mm. longi 0·8–1 mm. lati. Corollæ disci flavæ in dentibus hispidulæ 3·5 mm. longæ (tubulo 1·2 mm.), faucibus cylindrico-infundibuliformibus. Paleæ angustæ acutæ ad apicem denticulato-spinulosæ ad 5 mm. longæ. Achenia oblonga nigro-brunnea glabra sparse striata 3·8 mm. longa 1 mm. lata in angula exteriore angustissime in interiore late et oblique alata; alæ ad aristas 2 valde inæquales vel subæquales 1·4–1·8 mm. longas adnatæ; corona cyathiformis fimbriato-lacerata 0·5 mm. alta.—*Otopappus epaleaceus* Hemsl. var. (?) *Pringlei* Greenm.! Proc. Am. Acad. xl. 42 (1904).—Morelos: near Cuernavaca, alt. 1586 m., September 12th, 1896, *Pringle*, 6521 (cotypes: Brit. Mus., Kew). Distributed as *Otopappus acuminatus* Wats. Also reported by Greenmann from Iguala, Guerrero, *Holway*, 5313.

5. O. xanthocarphus Brandeg. Univ. Calif. Pub. Bot. iii. 394 (1909). Branching shrub, the stem greyish-brown, at length glabrate, substriatulate, the young branches densely and rather softly hispidulous-pilosulous with spreading hairs, scarcely tuberculate at base. Leaves ovate-oblong to ovate, acute, mucronate, not acuminate, truncate or truncate-rounded at base, regularly serrate with about 18–20 pairs of depressed-triangular mucronate spreading teeth, triplinerved, above green, harsh with dense tuberculate-hispidulous hairs, not impressed-nerved, beneath slightly paler or bluish-green, glandular-dotted and densely (especially along the veins) slightly harshly hispidulous-pilose with spreading hairs, 3·2–5·5 cm. long, 1·2–2·7 cm. wide, on densely subtuberculate-hispidulous scarcely margined petioles 2–4·5 mm. long. Heads in terminal 3–5-headed cymose panicles, the terminal and axillary monocephalous densely subtuberculate-hispidulous-pilosulous naked peduncles 4·5–14 mm. long. Disk (immature) 6 mm. high, 9 mm. wide. Involucre 5 mm. high, 4-seriate, graduated, the two outer series of phyllaries oblong, obtusish, densely tuberculate-hispidulous, herbaceous throughout or indurated below, the apex spreading, the two inner oblong to oval-oblong, acutish, indurated, pallid, membranaceous-coriaceous, with narrow ciliolate scarious-membranous margin, strigillose chiefly down middle of back, the outer sometimes with a slight herbaceous apex. Rays none. Disk corollas (immature) yellow, strigose-hispid chiefly on the teeth, 3 mm. long. Pales very narrow, acute, narrowly scarious-margined, spinulose-denticulate at apex, yellowish above, 6 mm. long. Achenes (of preceding year) brownish-black, obovate-oblong, striate, glabrous, 3·2 mm. long, 1·2 mm. wide, the outer wing very narrow, the inner broad, coalescent with the awn; paleaceous corona deeply lacerate, 0·3 mm. long. — Puebla: Cervio de Castillo, near Zupotitlan, July, 1908, *Purpus*, 3095 (type coll.: Brit. Mus.).

6. O. syncephalus J. D. Sm. Bot. Gaz. xl. 6 (1905) Type, *Türckheim*, 8694, Cubilquitz, Dept. Alta Verapaz, Guatemala, April, 1904. Not seen, but from description most nearly related to *O. robustus*, differing in its puberulous branches and inflorescence, leaves rough above, setulose-scabriusculous beneath,

smaller heads (5–6 mm. high and broad), and shorter (3 mm. high) 4-seriate involucre of oval phyllaries.

7. O. ROBUSTUS Hemsl. Biol. Centr. Am. Bot. ii. 191, t. 49 (1881).—Scandent shrub, the stem stout, striate, pilose with loose sordid hairs. Leaves ovate, acuminate, rounded to slightly and obliquely cordate at base, appressed-serrulate with minute mucronate teeth, penninerved, above green, slightly rough with tuberculate-based strigose-pilose hairs, beneath scarcely paler, densely rather softly pilosulose with dull spreading hairs, 6·5–13·5 cm. long, 2·2–5·9 cm. wide, on marginless petioles 1–1·9 cm. long, densely short-hispid-pilose with dull hairs. Heads ternately cymose-panicled on axillary and terminal 9–24-headed flowering-branches mostly shorter than the leaves. Pedicels 4–8 mm. long, densely short-pilose with dull spreading hairs. Disk hemispheric, 9–11 mm. high, 8–11 mm. wide. Involucre 5-seriate, graduated, 6–7 mm. high, the phyllaries oblong to oblong-ovate, acute to obtusish, indurated, pale, chartaceous-coriaceous, ciliate and ± appressed-pilosulous, with short spreading or reflexed herbaceous tips, the outermost series almost entirely herbaceous, the innermost without herbaceous tips, similar to but shorter than the pales. Disk corollas yellow, glabrous, with slender tube (1·3 mm. long) and erect funnel-form throat, 4·2 mm. long. Pales lacerate on sides, spinulose-ciliate at the abruptly narrowed acute apex, 8 mm. long. Achenes brownish, glabrous, slightly 2-costate on the sides, 3 mm. long, very narrowly winged on outer, broadly so on inner angle above, the wing adnate to the awn (2 mm. long); paleaceous corona lacerate, of about 6 fused squamellæ, 1·6 mm. long.—*Zexmenia robusta* (Hemsl.) O. Hoffm. in Engl. & Prantl, Nat. Pfl. iv. pt. 5, 230, f. 116*o* (1890).—VERA CRUZ: Valley of Cordova, March 5th, 1865–66, *Bourgeau*, 2030 (type: Kew).

8. **O. glabratus** (Coult.), n. sp. Frutescent, the stem slender, striate, pale, glabrous below, sparsely and minutely strigillose in the inflorescence. Leaves ovate-lanceolate, long-acuminate, cuneate at base, serrulate with about 14–18 pairs of weak mucronate teeth, feather-veined, the two lowest pairs of lateral veins enlarged, above green, smooth, minutely strigillose, in age glabrate and obscurely lepidote, beneath scarcely paler, pilosulous along the veins, elsewhere glandular-dotted, otherwise nearly glabrous, 7–11 cm. long, 1·2–3·1 cm. wide, on sparsely strigillose marginless petioles 1–2 cm. long. Heads numerous in axillary and terminal 3–14-headed slender spike-like racemose-cymose panicles about 2·5–5·5 cm. long, 1·2–1·8 cm. wide, much exceeded by the leaves; pedicels striate, 5 mm. long to almost none. Disk 6 mm. high, 6–8 mm. wide, turbinate-hemispheric. Involucre 3-sub-4-seriate, 2·5–3 mm. high, slightly but distinctly graduated, the phyllaries oval to oval-oblong, strongly indurated, coriaceous-chartaceous, strongly striate-vittate, obscurely thickened at the obtuse to rounded darker apex, ciliate, appressed. Disk corollas yellow, glabrous, strongly reflexed, the throat campanulate, the teeth triangular-lanceolate, 3 mm. long (tube 1·7 mm.). Pales subglabrous, carinate, acuminate, narrow, 4·8 mm. long. Achenes

(submature) brownish, glabrous, 2 mm. long, wingless on outer angle, there with an awn 0·8 mm. long, rather broadly and obliquely winged above from near the apex on the inner, the awn (2 mm. long) adnate to the wing; corona divided to the base into about 4 unequal lacerate squamellæ 0·5 mm. or less long.—*Otopappus curviflorus* (R. Br.) Hemsl. var. *glabratus* Coult.! Bot. Gaz. xx. 50 (1895). *Salmea curviflora* R. Br. var. *glabrata* (Coult.) Greenm. Field Col. Mus. Bot. iii. 124 (1904). *Otopappus brevipes* Rob. var. *glabratus* (Coult.) Rob. Proc. Am. Acad. xliv. 622 (1909).—GUATEMALA: Jumaytepeque, Dept. Santa Rosa, alt. 1830 m., November, 1892, *Heyde & Lux*, 4235 (type coll.: Kew).

TRANSFERRED AND INVALID SPECIES.

O. acuminatus Wats. = NOTOPTERA TEQUILANA (Gray) Blake var. ACUMINATA (Wats.) Blake.

O. alternifolius Rob. Proc. Am. Acad. xxvi. 165 (1891) = VERBESINA ALTERNIFOLIA (Rob.), n. comb. (not *V. alternifolia* (L.) Britton ex Kearney, Bull. Torr. Club, xx. 485 (1893), which is a synonym of ACTINOMERIS ALTERNIFOLIA (L.) DC. Prod. v. 575 (1836)). *Otopappus Robinsonii* Klatt, Annal. Naturh. Hofmus. Wien, ix. 362 (1894), nomen abortivum. *Verbesina Robinsonii* (Klatt) Fernald ex Rob. & Greenm. Proc. Am. Acad. xxxiv. 554 (1899).

O. Aschenbornii Klatt, Annal. Naturh. Hofmus. Wien, ix. 362 (1894), is based on *Verbesina Humboldtii* Klatt (nec Spreng.), Leopold. xx. 92 (1884). The species is a *Verbesina*, considered by Robinson & Greenman (Proc. Am. Acad. xxxiv. 554 (1899)) as perhaps identical with *V. Robinsonii* (= *V. alternifolia* (see above)). Type material has not been available.

O. brevipes Rob. = NOTOPTERA BREVIPES (Rob.) Blake.

O. brevipes Rob. var. *glabratus* (Coult.) Rob. = O. GLABRATUS (Coult.) Blake.

O. curviflorus (R. Br.) Hemsl. = NOTOPTERA CURVIFLORA (R. Br.) Blake.

O. curviflorus (R. Br.) Hemsl. var. *glabratus* Coult. = O. GLABRATUS (Coult.) Blake.

O. epaleaceus Hemsl. = NOTOPTERA EPALEACEA (Hemsl.) Blake.

O. epaleaceus Hemsl. var. (?) *Pringlei* Greenm. = O. PRINGLEI (Greenm.) Blake.

O. oaxacanus (DC.) Klatt, Annal. Naturh. Hofmus. Wien, ix. 362 (1894) = VERBESINA OAXACANA DC. Prod. v. 614 (1836).

O. olivaceus Klatt, *l. c.* (1894) = VERBESINA ARBORESCENS (Mill.) Blake, Journ. Bot. liii. 57 (1915).

O. perymenioides (Sch. Bip.) Klatt, *l. c.* (1894) = VERBESINA PERYMENIOIDES Sch. Bip. ex Klatt, Leopold. xxiii. 143 (1887).

O. Robinsonii Klatt, *l. c.* (1894) = VERBESINA ALTERNIFOLIA (Rob.) Blake. See above.

O. tequilanus (Gray) Rob. = NOTOPTERA TEQUILANA (Gray) Blake.

O. tequilanus (Gray) Rob. var. *acuminatus* (Wats.) Rob. = NOTOPTERA TEQUILANA (Gray) Blake var. ACUMINATA (Wats.) Blake.

COUNTY RECORDS OF POTAMOGETONS.

By Arthur Bennett, A.L.S.

In this Journal for 1898, p. 354, Mr. Britten in a notice of Fryer's *Potamogetons of the British Isles* suggested that a complete account of the distribution of each species should be given. This suggestion was overlooked, or it would have been carried out. The following records have accumulated since the Supplement to *Topographical Botany*, ed. 2 (Journ. Bot. Suppl. 1905), appeared. The nomenclature and arrangement are the same as in the Supplement.

Potamogeton pectinatus.

50. Denbigh. J. Bot. 1913, Supp. ii. 39.

P. flabellatus.

30. Bedford. Sanders sp.
85. Fife. G. West!

P. filiformis.

75. Ayr. Ann. Scott. N. H. 1899, 172.
86. Stirling. Kidston sp.
98. Argyll. G. West!

P. pusillus.

46. Cardigan. Salter.
69*b*. L. Lanc. Pearsall sp.

P. Sturrockii.

69*b*. L. Lanc. Pearsall sp.
109. Caithness. Lillie sp.

P. trichoides.

88. Perth M. Matthews sp.

P. compressus.

60. Lanc. W. Pearsall sp.
109. Caithness. Lillie sp.

P. obtusifolius.

69*b*. L. Lanc. Pearsall sp.
74. Wigton.
97. Westerness. } G. West!
98. Argyll.

P. acutifolius.

32. Northton. Druce sp.

P. crispus.

69*b*. L. Lanc. Pearsall sp.
96. Easterness. G. West.
104. Ebudes N. J. Bot. 1910, 225.

P. perfoliatus.

48. Merioneth. Jones sp.
50. Denbigh. J. Bot. 1913, Supp. ii. 39.

P. lucens.

60. Lanc. W. Pearsall sp.
69. Westmorland. Coomber sp.
73. Kirkcudbright.
96. Easterness.
97. Westerness. } G. West!
109. Caithness. Miss Lillie sp.
110. Hebrides. H. C. Watson, 1832.

P. prælongus.

38. Warwick. C. Waterfall sp.
43. Radnor. Miss Armitage!
50. Denbigh. J. Bot. 1913, Supp. ii. 39.
56. Notts. Carr sp.
93. Aberdeen N. Roy!
111. Orkney. Spence sp.

P. heterophyllus.

32. Northton. Druce!
59. Lanc. S. Travis sp.
97. Westerness. G. West!
103. Ebudes. Macvicar sp.

P. nitens.

29. Cambridge. Fryer sp.

31. Hunts. Fryer, Pot. Brit. 270.
32. Northton. Druce, herb. Salmon!
69*b*. L. Lanc. Pearsall sp.
110. Hebrides. Duncan sp.

P. FALCATUS.

31. Hunts. Fryer sp.
56. Notts. Carr sp.

P. INVOLUTUS.

32. Northton. Druce!

*P. COOPERI.

56. Notts. Carr sp.

P. ZIZII.

72. Dumfries. Ann. Scott. N. H. 1899, 171.
96. Easterness. } G. West!
97. Westerness. }

P. RUFESCENS.

44. Carmarthen. Knight sp.
69*b*. L. Lanc. Pearsall sp.

P. NATANS.

18. Essex S. Gibson, Flora.
73. Kirkcudbright. G. West!
94. Banff. Dickson, Guide, 179.

P. POLYGONIFOLIUS.

8. Wilts S. Flora, 319.
26. Suffolk W. Flora, 359.
33. Gloster E. J. Bot. 1912, 350.
56. Notts. Carr.

P. PLANTAGINEUS.

37. Worcester. Flora, 373.
53. Lincoln S. Druce, 1911!
56. Notts. Carr sp.
60. Lanc. W. Wilson sp.

NOTES ON STATICE.*

By C. E. Salmon, F.L.S.

XI.—Statice minuta Linn.

The original description of this plant occurs in the *Mantissa Plantarum* of Linnæus, p. 59 (1767), as follows:—

"Statice caule suffruticoso folioso, foliis confertis cuneatis glabris muticis, scapis paucifloris.

"Limonium maritimum minimum. *Bauh. pin.* 192, *prodr.* 99. *Bocc. sic.* 26, t. 13, f. 3.

"Limonium fruticosum minimum glabrum. *Pluk. alm.* 221, t. 200, f. 5.

"Limonium siculum, folio cordato. *Bocc. sic.* 64, t. 34.

"*Habitat* ad Mare Mediterraneum. ♄.

"Plantæ *longitudo vix digiti.* Flores *pallide rubentes.*"

The example in Linn. Herb. representing this species was at first labelled "*fruticulosum*," but this was cancelled and "*minuta*" substituted: this, according to Dr. B. D. Jackson, was probably done by the younger Linnæus. The specimen falls under the variety *microphylla* mentioned later.

As regards the synonymy quoted by Linnæus, I think it is clear, from the following description given by Bauhin (Prodr. 99 (1620))

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* See Journ. Bot. 1903, 65; 1904, 361; 1905, 5, 51; 1907, 24, 428; 1908, 1; 1909, 285; 1911, 73; 1913, 92.

of his *Limonium maritimum minimum*, that this is also var. *microphylla*:—"Tota plantula uncias quatuor vix excedit; nam ad radiculam oblongam, rufescentem, in summo divisam, foliola minima, subrotunda, crassa, instar Sedi compacta, interque caulículi unciales, paucos flosculos pallide rubentes, vel subcæruleos sustinentes, exurgunt. Hoc in insula quadam non longe Massilia, provenit."

The figure and description, as well as the locality cited in Boccone, Pl. Sicil. 26, t. xiii. f. 3 (1674), point also to the same plant.

I consider, however, that the *Limonium fruticosum minimum glabrum* of Plukenet's *Almagestum*, 1696, from his description (p. 221) and figure (Phytogr. t. 200, f. 5), comes under typical *minuta*; an authentic specimen in Hb. Sloane (vol. 96, f. 149), collected by Plukenet, bears this out.

The last synonym quoted by Linnæus is certainly not correct; Boccone's *Limonium siculum, folio cordato* (*op. cit.* 64, t. 34) cannot be placed under any form of *S. minuta*. The figure has been appropriated by Lojacono Pojero (Fl. Sic. ii. pars 2, 25, 1907) to represent his new *S. Bocconi*, but, judging by specimens kindly given me by Mr. C. C. Lacaita, the drawing does not do this fine species anything like justice: however, no other figure is quoted and probably no satisfactory one exists.

There is little doubt that Parkinson had in mind the variety *microphylla* of *S. minuta* in the following description (Theatr. Bot. 1234 (1640)):—"5. *Limonium minimum*. The smallest Sea Marsh Buglosse. This least *Limonium* is scarse foure inches high, having from a small long reddish roote parted at the toppe into sundry heads, a number of small fat roundish leaves thicke set together, in forme and manner of a small House-leeke, the flowers are few and small that grow on the small stalke, of a faint reddish blew colour. . . . All these sorts grow in the wet fieldes neere the Sea, some in our owne land, as the first and second, the other three * next them in France about Mompelier, and Marselles, and Ligorne also. . . . The fourth and fifth are set forth by Bauhinus onely in his *Pinax* and *Prodromus*."

Boissier in DC. Prodr. xii. p. 655 (1848) created four varieties of *S. minuta*, as follows:—

"*β. pubescens*—*S. pubescens* Reichb. Ic. 2, tab. 326, non DC.!—In Galliâ australi. Differt a *S. pubescenti* verâ ramis sterilibus non flexuosissimis, bracteâ superiori duplo majori, spiculis dissitis.

"*γ. microphylla*, foliis ovato-rotundatis imbricatis sæpe vix 1–2 lin. longis latisque, scapis fere capillaribus apice paucifloris—Formis innumeris in speciem transit—In Galliâ australi! Balearibus!—Bocc. sic. tab. 13 et Pluk. alm. 200, f. 5 (pessima).

"δ. *acutifolia*, foliis lineari-spathulatis acutis, scapis brevibus paucifloris—In Liguriâ (Moretti), Corsicâ ad Bonifacio (Salzm!),

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* *Limonium minimum* is **No. 5. It grows at Marseilles, but not at Montpellier or Leghorn. These localities must refer to Nos. 3 and 4.**

Sardiniâ (Moris). *S. rupicola* Badaro pl. exs. *S. acutifolia* Reichb. Ic. 3, fig. 374. *S. tenuifolia* Bertol. in coll. herb. Pedem. Moris elench. sard. Foliis hinc inde obtusis in speciem redit.

"ε. *dissitiflora*, ramis minus strictis magis divaricatis, spiculis bifloris laxius in spicas longiores magis patulas dispositis.—In Corsicâ ad Bonifacio (Sieber! Soleirol!), insulis Balearibus (herb. Fauché!), Catalauniâ ad Montjouy (herb. Boiss.)."

These varieties will now be considered *seriatim*, with the exception of "δ. *acutifolia*," which I consider worthy of specific rank; this will form the subject of a future note.

Var. PUBESCENS. Boissier's var. *pubescens* is destitute of a description, beyond a few characters to distinguish it from the true *S. pubescens* of De Candolle. I have carefully examined Boissier's own specimens and compared them with the typical glabrous state and with the true *pubescens*: it varies greatly as regards pubescence, and it has more than once crossed my mind that this puberulent state might be the result of the glabrous *S. minuta* crossing with the densely-pubescent, almost velvety *S. pubescens*. The idea originated, I think, when it was observed that obviously acute as well as almost obtuse * outer bracts are found sometimes *on the same scapes* of these puberulent examples—a combination I have not so far seen in typical *minuta*.

However, definite conclusions as to hybridity can only be established by observation on the spot or by cultural experiments. The localities of both species appear to overlap: Thompson (Fl. Pl. Riviera, 181 (1914)) and Albert & Jahandiez (Cat. Pl. Var, 401 (1908)) note that true *S. pubescens* is "often found with *S. minuta*," but I have no personal knowledge that the two species grow intermingled. For the present, therefore, I propose to treat the plant as a "forma *puberula*" of *S. minuta*, from which the true *S. pubescens* DC. may be distinguished by the shape of its outer bract, by being much more pubescent; its sterile branches are more dichotomous and zigzag, its spikes denser, its leaves usually truly retuse and not falsely so, and by other features.

Autheman has gathered and distributed (C. Magnier, Fl. Select. 2563) a small state of the true *S. pubescens* DC., under the name of *S. minuta* L. forma *pubescens* Autheman.

Var. MICROPHYLLA. This, as mentioned previously, is the plant of Linn. herb. and seems, particularly as regards the Balearic examples, a well-marked variety. I have not observed that "formis innumeris in speciem transit" as noted by Boissier. The remarkably rounded leaves and the absence (usually) of sterile branches are the more obvious features of this plant.

Var. DISSITIFLORA. This variety is rather puzzling. I have examined in his herbarium specimens from all the localities mentioned by Boissier, but I have been unable to find any other examples in the various important collections at the British Museum, Kew, Florence, Oxford, &c. I conclude, therefore, it

* Obtuse outer bracts are an important feature of *S. pubescens* DC.

must be a very local form, possibly occurring only in small quantity in each station. The Catalonian locality may, indeed, produce this no longer, as M. Sennen, of Barcelona reported, in 1914, that he had examined the neighbourhood of Monjuich (the "Montjouy" of Boissier, *l. c.*), where he says very few Statices occur, and could only find *S. virgata* Willd. Willkomm & Lange (Prod. Fl. Hisp. ii. p. 375 (1870)) do not admit *S. minuta* as a Spanish plant, and Costa (Fl. Cataluna, p. 209 (1877)) asserts that *S. minuta* ε. *dissitiflora* Boiss. does not grow at Monjuich, but that the plant there is a small form of *S. virgata*.

To sum up, it seems evident that *S. minuta* L. (and its varieties as restricted in this paper) is not a very widely distributed or abundant species; but the name has been used by many authors on the Continent, particularly in Italy, as a convenient receptacle in which to place puzzling forms, or possibly hybrids, not falling satisfactorily under any other species. For instance, Fiori and Paoletti (Ic. fl. Ital. t. 2716) figure a plant that certainly looks like normal *S. minuta*, but when one finds the same authors (Fl. anal. Ital. ii. 1902) including such good species as *S. virgata* W. and *S. minutiflora* Guss. as varieties under *S. minuta*, one can only conclude that they, like Gussone, Bertoloni, and Parlatore, failed to grasp the essential characters of the true *S. minuta*.

Similarly, U. Martelli, in his Revista Crit. spec. Ital. gen. *Statice*, 1887, arranges *S. virgata* Willd., *S. remotispicula* Lacaita, *S. Cumana* Ten., and other diverse species as varieties under *S. minuta*, and I fail entirely to follow his Revision. He makes, however, an interesting note upon *S. minuta* var. *microphylla* on p. 13 (which he calls "var. *balearica*"), which I translate as follows:—"The very small leaves which clothe the whole stem, the cæspitose habit, low and compact, somewhat different from the type and recalling that of *Saxifraga cæsia*, are the characters which distinguish this variety."

The examples of *S. minuta* seen from Spain are few; the habit is rather different from that of the plants from the French coast, the panicle being more lax and luxuriant and the leaves being rather less revolute.

S. minuta L. has been mentioned by some authors as occurring in Algeria, *e. g.* Battandier & Trabut (Fl. de l'Algérie, fasc. iv. 733 (1890)), but as I find these botanists omit it in their later work on this region (Fl. anal. de l'Algérie, 1904), I presume there was some error or confusion of species. M. Jahandiez in Ann. Soc. Hist. Nat. Toulon, 1913, expresses doubt if it occurs in Algeria.

It is sometimes necessary to be careful not to confuse small states of *S. virgata* with *S. minuta*; in the former species the leaves are not revolute, and their margins show a pellucid border when dry, the spikelets are more arcuate and the bract-proportions different, &c.

The synonymy, description, and distribution may stand as follows:—

STATICE MINUTA Linn. Mant. 59 (1767), excl. syn. L. siculum Bocc.; Desf. Fl. Atlan. i. 275 (1798); Reichb. Ic. crit. ii. 78 (1824); Gren. & Godr. Fl. Fr. ii. 745 (1850); Reichb. Ic. fl. germ. xvii. 64 (1855); Rouy, Fl. Fr. x. 147 (1908); non auct. Ital.

S. minuta L. forma *glabra* Autheman exsicc.!

Limonium fruticosum minimum glabrum Pluk.! Alm. 221 (1696).

L. minutum O. Kuntze, Rev. Gen. pars 2, 395 (1891).

Icones.—Pluk. Alm. t. 200, f. 5!; Reichb. Icon. Crit. ii. t. 186, f. 325!, Ic. germ. xvii. t. 1144, f. 2!; Mutel,* Fl. Fr. t. 55, f. 411!; Coste, Fl. Fr. iii. 3042!; Cusin, Fl. Fr. xix. t. 28!

Exsicc.—Billot, Fl. gall. et germ. 3187! Magnier, fl. select. 2562! Soc. Rochelaise, 1896, 3975!

Radix lignosa supra crebro partita; planta plerumque *nana*, *glabra*, *scabridula*; folia *parva* obovato-spathulata *in petiolum sensim attenuata*, laxe imbricata sæpe *rosulata* viva plana *in sicco supra rugosa*, *margine* leviter (in sicco distinctius) *revoluta*, apice rotundata (sæpe minute apiculata) in sicco recurva ita *apicem pseudo-retusum* formante. Scapus 5–10 cm. altus, erectus, *a basi vel infra medium* ramosus; rami *ascendentes*; rami steriles *pauci*, *paulo anfracti*, sæpius *subsimplices*. Spicæ *laxifloræ*, ascendentes; bracteæ *nigricantes*; bractea media quam exterior *sesquilongior*; bractea interior quam bractea exterior *3·5-plo longior*; calyx 5–5·5 mm. longus; corolla diam. 5–6 mm., violacea.

Root perennial, woody, long-lived, branching at the crown into several ± elongating divisions bearing the remains of decayed leaves. *Plant* usually dwarf, glabrous, ± scabrid. *Leaves* 1-veined, small, obovate-spathulate, gradually tapering into petiole, laxly imbricate and often forming rosettes and clothing the stem below same, "spongy" (rugose) above when dry; margin revolute (much more pronounced when dry); apex rounded (often with a minute apiculus) recurved and thus forming with the deep furrow above (when dry) a falsely-retuse apex. *Scape* ± erect, only slightly zigzag (4) 5–10 cm. (rarely 20 cm.) high, rather sparingly branched from near base or below the middle. *Branches* and *branchlets* ± ascending; sterile branches few, slightly flexuose, usually almost simple. *Spikes* ± lax-flowered, ± ascending. *Spikelets* 1–2 flowered (usually 1), with usually a rudimentary one also. *Bracts* usually dark-coloured. *Outer bract* $1\frac{1}{4}$–$1\frac{3}{4}$ mm. long and slightly broader, ovate-triangular ± acute, with broad membranous margin, herbaceous portion ± apiculate and sometimes exceeding margin with an apiculus, glabrous. *Middle bract* 2–$2\frac{1}{2}$ mm. long, irregularly oblong-ovate, apex rounded, truncate or erose, hyaline with usually two veins, glabrous, about half as long again as outer bract. *Inner bract* $4\frac{1}{2}$–$5\frac{1}{2}$ mm. long, about 3 mm. broad, oval, ± obtuse, with broad membranous margin, herbaceous portion apiculate, glabrous, about $3\frac{1}{2}$ times longer than outer bract. *Bracteoles* 1–3 (usually 1), $2\frac{3}{4}$–$3\frac{1}{4}$ mm. long,

* These figures are copies, slightly altered, of those in Reichb. Icon. Crit.

irregularly oblong-obovate, apex rounded or emarginate, hyaline with veins, glabrous. *Calyx* 5–5½ (rarely 6) mm. long, slightly curved, infundibuliform, membranous and dilated about half-way up (including lobes); calyx-lobes about 1 mm. long, triangular-oblong, plicate, appearing acute but tips ± obtuse when compressed; calyx-tube about 2½ mm. long, veins acute, usually running half-way up lobes; calyx distinctly hairy (often ± densely), on ribs and between same with ± appressed hairs, from base to half-way up calyx (excluding lobes). *Corolla* 5–6 mm. in diameter, violet.

Distribution.—Southern France: Bouches-du-Rhône (about Marseilles! L'Etang de Berre! Martigues!). Var (St. Cyr! Toulon! Porquerolles! La Seyne! Between St. Nazaire and Brusq! Presqu'ile de Giens! Near Hyères!). *Spain*: Cap Rosa, Catalonia! Cartagena, Murcia!

Forma PUBERULA.

S. pubescens Reichb. Icon. Crit. ii. 78 (1824); Mutel, Fl. Fr. iii. 88 (1836); *non DC.*

S. minuta β pubescens Boiss! in DC. Prodr. xii. 655 (1848); *non* Lois. Fl. Gall. ed. 2, i. 225 (1828); *nec* forma *pubescens* Autheman exsicc.! *nec* forme: *S. pubescens* Albert & Jahandiez, Cat. pl. Var, 401 (1908).

Icones.—Reichb. Icon. Crit. ii. t. 187, f. 326! Mutel, Fl. Fr. t. 55, f. 412!

Tota planta, bracteis bracteolisque haud exemptis, *plus minusve parce puberula.*

Whole plant, including bracts and bracteoles ± sparingly puberulent, with hairs on calyx extending higher; otherwise as in type.

Perhaps a hybrid between *S. minuta* L. and *S. pubescens* DC.; sometimes, on the same scape of f. *puberula*, there may be found outer bracts showing affinities with these suggested parents.

Distribution.—Southern France: Bouches-du-Rhône (about Marseilles!). Var (St. Cyr! Between St. Nazaire and Brusq! Toulon! Near Hyères! Between Brusq and Sanary!). *Spain*: Cap Rosa, Catalonia!

Var. MICROPHYLLA Boiss.! in DC. Prodr. xii. 655 (1848).

S. minuta L. var. *balearica* Mart.! Rev. crit. Ital. Stat. 13 (1887).

S. minuta L. formæ *minor* et *major laxa* Porta et Rigo! exsicc. (1885).

S. minuta Linn. herb.! Porta et Rigo! exsicc. (1885).

Limonium maritimum minimum Bauh. prodr. 99 (1620); Petiver, hort. Vaillant in Hb. Sloane! (t. 164, f. 326); Bocc. ic. Sic. 26 (1674).

L. minimum Park. Theat. bot. 1234 (1640).

Icon.—Bocc. ic. Sic. t. 13, f. 3!

Folia *sæpe parvula, latiora, subrotundata, in petiolum subito attenuata*, magis imbricata, *densiusque rosulata*; in sicco apice margineque *minus revoluta*, raro apiculata. Scapus 3–8 cm. altus (raro 13 cm.); rami steriles *nulli aut perpauci.*

Spicæ *densiores*; bracteæ rufescentes, bractea media quam exterior *haud sesquilongior*; bractea interior quam exterior *modo 3-plo longior*; **calyx 4–5 mm. longus.**

Leaves often very small, more abruptly contracted into petiole, lamina broader and more orbicular or cuneate; margins not quite so revolute when dry, and leaves less strongly furrowed, hence not so retuse when dry; leaves rarely apiculate; rosettes more dense and compact. *Scape* usually short (3-8 cm. high), rarely 13 cm. (the "forma *major laxa*" of Porta et Rigo exsicc.), with either no sterile branches or fewer than in type. *Spikes* more dense-flowered. *Bracts* not so dark-coloured. *Middle bract* not half as long again as outer bract. *Inner bract* about 3 times longer than outer bract. *Calyx* 4–5 mm. long.

Distribution.—Southern France: Bouches-du-Rhône (near Marseilles!). *Balearic Islands*: Majorca (Calabra!). Minorca (near Mahon! Cola-Mezquita, Ciudadela & Fornells!). *Spain*!

Var. DISSITIFLORA Boiss.! in DC. Prodr. xii. 655 (1848).

Folia inter typum et var. *microphyllam* intermedia. Scapus 8–16 cm. altus, *magis anfractus*; rami *patento-arcuati*; rami steriles sicut in typo.

Spicæ *magis elongatæ patulæque*, spiculæ *dissitæ*. Bracteæ nigricantes; bractea media sicut in typo; bractea interior sicut in var. *microphylla*.

Calyx sicut in var. *microphylla* sed minus hirsutus.

Leaves of moderate size, about intermediate in shape between those of type and var. *microphylla*, very rarely apiculate. *Scape* 8–16 cm. high, rather more zigzag than in type, with spreading-arcuate branches; sterile branches as in type. *Spikes* more elongated and spreading, with spikelets more separated than in the other varieties. *Bracts* usually dark coloured; *outer bract* rather more obtuse than in the other varieties; *middle bract* as in type; *inner bract* as in var. *microphylla*. Calyx as in var. *microphylla* but less hairy.

Distribution.—Spain: Monjuich, near Barcelona! *Balearic Islands*: Majorca (Palma)! *Elba*! *Corsica*: Bonifacio!

I am much indebted to various Museums and individuals for the loan of specimens and help in other directions, and I particularly wish to thank Mr. C. C. Lacaita for the assistance he has so readily given in this puzzling genus.

RICHARD MIDDLETON MASSEY.
(1678?–1743.)

By the Editor.

The following account of this interesting seventeenth century naturalist is drawn almost entirely from his unpublished letters (dated 1702–41) to Sloane (Sloane MSS. 4040–78) and to Petiver (4063–67) and from Petiver's copies of his replies (Sloane MSS. 3332–40). The only published notice with which I am acquainted

is that by Munk,* from which a few of the facts in this sketch are derived.

Richard Middleton Massey, a member of a well-known Cheshire family, was the eldest son of Edward Massey, of Rostherne near Knutsford, in that county; his mother's name before marriage was Elizabeth Bowles. We know nothing of his early history previous to his going to Oxford, where "he spent some terms at Brasenose College, but left without taking a degree." By this time, however, he must already have become fairly proficient in entomology, as is shown by the earliest of his letters written from Oxford to Petiver and preserved in the Sloane MSS., and acquainted with leading naturalists of the time. The first letter runs:—

"Hon^{le} Sir "Oxon, June 16, 1702.

The Catalogue of y^{e} Scarabæi that I sent you has y^{e} tytles of all that are mention'd in Dr. Lister's manuscript. My collection here is very small, those y^{t} I pick'd up in Cheshire I formerly gave to Mr. Bobart, before I had y^{e} honour of being acquainted with y^{r} self. I think I have 3 or 4 w^{ch} are not mention'd in y^{e} MS. I design to bring them with me, immediately after our Act is over. I have sent you by y^{e} Oxford carrier a specimen of y^{e} Lexicon I mention'd to you. The design I beleive you will easily see, tho' I had not room in y^{e} tytle to give an acc^{t} of it. I humbly desire y^{r} thoghts of y^{e} work & if you think it is worth encouragement. If you want any more specimens pray lett me hear from you speedily. Dr. Kreig's Papilio & the exotic Scarabæus shall come up with me, they are safe. Pray tell me is Dr. Sloanes collection put to rights yett &c. If you have any comands to lay upon me, they shall be carefully & willingly perform'd by

Dear Sir y^{r} most affectionate
obljged Serv^{t}
"R. Myddleton Massey."

The "Lexicon" referred to may possibly have been a list of beetles, but there is nothing in the correspondence which throws any light upon it; whatever it was, it was never published.

To the next year must probably be assigned the following undated letter, misplaced in 4067, f. 49, written from "Brazennose" and noted by Petiver as "received Mar. 12."

"My dear freind

(For by y^{t} too familiar title I beg I may henceforth style you without offence) what I have promised I will endeavour fully to perform. I have sent y^{e} names of Dr. Lister's Beetles as they are ordered in his Manuscript. Mr. Lhwyd returned the same night that I did & order'd when I writt y^{t} I should present his service to you, he designes to stay in town this month & then

* Munk, *Roll of the Royal College of Physicians*, ed. 2, ii. 93 (1878). Massey is described in Sloane Index as "of Wisbeach and Chester," but there is no evidence that he was at Chester save as a casual visitor.

for Cambridge. Mr. Bobart is harty and well I was with him this afternoon gathering herbs in order for a hortus siccus. Y^se^ pictures y^t^ I have of y^rs^ shall be kept safe & return'd speedily, in y^e^ meantime if you have any more buisness for me, let me know by letter, y^r^ desires shall ever be commands with y^r^ much obliged freind y^r^

humble serv^t^

R. MYDDELTON * MASSEY.

"Pray dont forget y^r^ plates when they are printed of; nor y^e^ putting y^r^ freind in a method of liveing att London or beyond sea when he leaves y^s^ place."

Massey's next letter (to Sloane) is dated from Tabley Hall near Knutsford—a place to be associated in the following century with another British botanist, John Leicester Warren—Aug. 7, 1704. He had expected to be in London "long before this time" but his "good fortune" had hindered him.

"This sumer has been spent in travailing with a young Gentleman into y^e^ northern and western parts of this Kingdom. A draught of St. Mungus's old well w^ch^ indeed is a very indifferent place I intend to bring with me, with some petrefaction from Knaresborough and the peake in Derbyshire a particularly form'd stone from Lyme park in Cheshire y^e^ Muscus odoratus from Holy well, some stones & oar from S^nt^ Vincents rock. We went to visite Bonewell near Ricards Castle in Shropshire, but the miracle is ceased for we coud meet with none of the little bones. Beetles I have mett with very few, the cruciatus hysteri male & female Ive preserv'd." He was then going into Shropshire "to bid some relations farewell": on his return to Tabley, he wrote (Sept. 27) giving a list of books he had purchased; from this and the reference to "farewells" it may be assumed that he was arranging to settle in Wisbech, whence he wrote to Sloane with regard to a patient on April 10, 1705. Here he at once succeeded so well in his practice that from Wisbech he wrote to Sloane on July 4 of the same year a long and interesting letter in which he says he had "mett with business above [his] expectation" and had not yet become "well enough acquainted to give any account of what is rare: Sinapi montanum foliis pilosellæ grows in one certain ground here, but whether I give it the true name I can't tell: I have reserv'd some specimens for y^u^ & Mr. Petiver." His letter contains references to fossils and an account of a visit to Crowland Abbey, whose condition he describes. Many of his letters relate to medical matters; others show his interest in coins and other antiquities.

In October 1706 he speaks of taking the shop and carrying on the business of an apothecary who was leaving the town, and asks Sloane to obtain from the College of Physicians the licence necessary for this purpose. On the 23rd of the following month he was admitted an extra-licentiate of Brasenose College. On

* In his earlier letters the name is thus spelt, but in later ones it is written "Middleton," in which form it is always printed.

March 24, 1707, he writes to Sloane as to his marriage, on his return from his "dreaming month"—a pretty synonym for honeymoon; and on Nov. 2 writes "my wife made me a present of a lusty boy yestermorn."

In August, 1709, Massey writes of a visit to Cheshire and Lancashire, during which he met with "an originall picture in oil paint of Mary Davies, the Horned Woman of Saughall in Cheshire;" for this he was anxious to "hear of a chapman."*

From this period until 1713 his letters relate chiefly to the purchases of books and MSS., which he had begun to collect as early as 1705. He had a very considerable library, of which he published a Catalogue (I have not been able to see a copy) in 1718: two MSS. formerly in his possession are in the Sloane collection (1124, 2747). In 1712 he was elected a Fellow of the Royal Society.

On Nov. 9, 1713, Massey writes to Sloane concerning the medical virtues of *Agrimonia odorata*, of which, assuming the specimens employed were originally of native growth, he was the earliest known observer in England, its first printed record dating from 1853, when it was recorded in Ann. Mag. Nat. Hist. (xi. 363) as having been found in Ireland by Babington and Newbould, and in Devon and Cornwall by Joseph Woods. His letter runs:—

"For some years past I have much used in my Practise an Infusion or tea made with the leaves of the Agrimonia odorata Park. C. B. Col. I find very good effects from it in Pleuritic cases wch. are frequent in our fenny country. Tis the only Pectoral drink I prescribe. A small bed w^{h} I cultivate in my little garden very well pays the charges of it. I keep it intirely to myself & people send to me for it. They drinke it as they doe other Teas with or without milk, 'tis very pleasant & much beyond the comon agrimony. I woud (my Greatest Friend) recomend it to you as an extraordinary grateful astringent in sputu cruento w^{ch} Dr. Thorp tells me you are too too much subject to. I beg you'l pardon this Impudence in a young man who owes everything he's master of to yourself & who has all the reason in the world to esteem next his Parents. If y^{r} Physic gardens do not afford it I will send you a tryall by the post."

Although only one letter (Feb. 19, 17$\frac{10}{11}$) during the preceding period has been preserved, Massey's correspondence with Petiver seems to have been steady. On May 24, 1714, he writes that he has heard of Petiver's projected excursion to the Peak: that he himself was "willing to be at Buxton about that time" on his way to Knutsford, and offers to meet him at that place or at Derby or Nottingham: "but if you are on horsback, it is not above half a days jouney to come by Wisbech, from whence I will show you the way into that Country & bring you by cartloads of Stratiotes Aizoides; nay, you will meet that & the Conyza foliis laciniatis [*Cineraria palustris*] on your way to me." Petiver replies on May 27 (MS. 3340, f. 63, back) that he could not go so

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* "Horned women" were exciting some attention at this period: see a paper in *Memoirs for the Curious*, ii. 197. Portraits of Mary Davis are in the Ashmolean Collection and in Leigh's *Natural History of Cheshire*.

soon, but hopes to do so later; he asks for the localities of the Conyza and of Lingua avis seu Virga aurea species [*Senecio paludosus*] "the sight of w^{ch} will give me great temptations of visiting you w^{ch} I believe will be in a chaise. The Stratiotes Aloides I saw plenty of in Holland & y^{e} Conyza once, but could not then get it, being in a Berline or Dutch Coach w^{ch} with their Trachschutes or [illegible] will never stop untill y come to their Journey's end." He mentions that he has completed the ten decades of his *Gazophylacium*, which Massey "shall have for 30 shillings with a Table dedicated to you on condition you will be a Patron to my British Herball."

Massey's reply (not dated and thus out of its sequence) is in MS. 4067, f. 48: "Lingua avis grows near Stretham ferry in the road betwixt Cambridge & Ely: Conyza fol. lac. I have found in great plenty along the old Podike from Stowbridge & betwixt Wisbech & Peterburgh. Stratiotes there is plenty in y^{e} road to Wisbech from Ely between Mapole & Chatteris. . . . As for subscribeing to y^{r} Brittish plants my present circumstances will not give me leave & the Gentlemen of y^{e} Club are not at all curious in naturall history. I will propose it to them, but I coud wish I had a specimen of y^{e} work to show them." The Club referred to is the Gentlemen's Society at Spalding, whereof Massey was a member, and of which a full account will be found in Nichols's *Literary Anecdotes*, vi. pp. 1–162. Massey expresses his "design to set out for the Peak Cheshire Lancashire &c. on Monday the 21 of this month [June] & shall return the Saturday 17th of July, about which time I shall expect y^{r} company at Wisbech. My enquirys are most after Antiquitys Medalls & Manuscripts wherever I goe, my time not being sufficient for Botanical enquirys." Petiver, with characteristic enthusiasm and undeterred by this last remark, writes at once (June 16) sending Massey "a Catalogue of such Plants as grow in Darbyshire & y^{e} neighboring Mountains or ab^{t} you in y^{e} Towns" and asks him to "send a Quire or two fil^{d} with with their specimens, particularly y^{e} Lingua Avis and y^{e} Conyza palustris fol. integris & laciniatis" (3340, f. 66). It is to be feared that the lavish collecting of "a quire or two" (or more) of the latter at a comparatively recent date is largely if not entirely responsible for the extinction of this rare British plant, if indeed it be extinct.

In June, 1716, Massey writes to Sloane regarding a large pot of copper coins found by a countryman in an adjoining parish, and of "a large old boarded peice of paint, upon the top of [which] is wrote 'Nomina & insignia militum singulatim cum singulis monachis in Ecclesia Eliensi collocatorum regnante Gulielmo conquestore Anno Domini 1087.' I have coppyed the Arms in water colours upon a sheet of large paper & design to send it to y^{e} R. Society." He also records "a prodigious hailstorm" and concludes with "a petition": "there is a limner in Crayon that will be at Wisbech a month hence. I beg you will give him leave to copy y^{r} Picture at my own charge that way to bring with him. I think you have one in y^{r} house as I remember well done & like."

At this time he had employed in his practice an oil of mustard for which he was anxious to obtain a patent, and writes in August, 1717, asking for Sloane's help in so doing. This was afforded, for in November he writes thanking Sloane and proposing to exhibit a bottle of the preparation at a meeting of the Royal Society, as well as to write "a short Latine Epistle & sending it with a bottle to Mosco Dantzic Hambrough Leiden & other foreign places."

On March 7, 1720, Massey was created Doctor of Medicine by the University of Aberdeen. In August, 1721, he writes to Sloane: "I am now drawing after my fashion the flowers & seeds of plants in water-colours upon a fine large paper w^{ch} I have gott from Holland, I partly copy after Tournefort, laying him before me." He had "laid out fifty guineas in books being the conjoyned Librarys of a French and English Clergyman deceased at Thorney Abbey," but is anxious to dispose of those of little use to him, of which he encloses a list, asking Sloane to "comand" any he has not; "the rest I shall truck or sell to Kit Bateman."

In November, 1724, Massey writes to Sloane: "I have sent several specimens of . . .* plants away. I have lately thought of [to] make a Hortus siccus. I hope I shall [per]fect it when I can procure proper . . . If you think it of any service I shall [glad]ly comunicate it to the Society. If you [please] to accept of the MS. twas what I . . . met with."

His last letter from Wisbech is dated Jan. 9, 1725, and is of purely medical interest: the next preserved is dated from Rostherne, Feb. 21, 1740. During the interval Massey had taken up his residence at Stepney,† and was doubtless in frequent personal relations with Sloane. In the absence of Stukeley he acted as Secretary to the Society of Antiquaries (of which he had become a Fellow in 1718) in 1725–7, in which latter year two coadjutors were appointed to assist him. On Sept. 29, 1724, he brought to the Society "a copper effigy, or medallion, performed by Albert Durer, together with a print of it etched by himself which he gave to the Society." Nichols ascribes to him the Latin verses, signed "M. M." prefixed to Stukeley's *Itinerarium*, published in the same year.‡ In this year, too, his name appears in the third edition of Ray's *Synopsis*, where he is mentioned (p. 461) as having found a cut-leaved form of Elder at Walsoken near Wisbech and a "Tubera Terræ" (*Tuber melanosporum* Vitt.) at Tabley (p. 476). He became intimate with John Martyn, to whom he was introduced by Patrick Blair; for Martyn, who in the preface to the work styles him "amicus doctissimus," he drew a plate (dec. iii., 9), published in 1731, of the *Historia Plantarum Rariorum*: Plate 3 Decade i of this work is dedicated to him.

In 1727 he prepared a catalogue of the library of the College

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* The edge of the letter is cropped.

† Munk says he left Wisbech for Stepney in 1720, but this, as the letters show, was not the case. Dillenius visited him at Wisbech in July, 1725: see Nichols, Illustr. i. 398.

‡ Nichols, Lit. Anecdotes, vi. 73, 158; Illustr. iv. 495.

of Physicians, which voted the sum of £10 for the purchase of a piece of plate in recognition of his services.

The fifteen years of Massey's residence in London are unrepresented in the correspondence: Petiver had died in 1720, and with Sloane he was doubtless in frequent personal communication. That he had not abandoned his interest in botany is shown by a collection of Maryland plants formed by Andrew Scott in 1736 and presented by Massey to Sloane. A long letter from Scott accompanied the specimens and is placed with them in Herb. Sloane vol. 316; from this it appears that Massey had a brother in Maryland, who had urged the sending of the plants, of which a further collection is promised.

On Feb. 21, 1740, Massey writes to Sloane from Rostherne a letter from which it would seem that he had returned to his native county in the previous year. He says:—"When I first came into Cheshire I found my house full of workmen, w^{ch} employed my thoughts two months," and complains of having been "confined at home all this winter," as a consequence of rheumatism which had followed on a fall from his horse, leaving him "very feeble and weak." It is rather a sad letter, as are those that follow it, for although his old interests remain, his "being in continual pain" prevents his writing and he has "no corresponce in London." He adds: "I hope [Mr. Edwards] will send me the new Pharmacopœia if printed & bound, tis to make me amends for a Pharmacop. I left with them cum notis M^{rs} Gualteri Charlton M.D." This is probably the "annotated copy" to which Munk refers as being in the College, and from which he derived much assistance.

In the following April he writes of a visit to Chester and Wales, "but was driven from thence by great snows upon the mountains w^{ch} very much affected him. As the warm weather comes on I mend visibly & intend speedily a journey to Buxton baths to try what they will do." In the last letter of the series, in which he records another fall from his horse and consequent illness, he speaks of this visit, from which at first he derived benefit but "the cold winds from the mountains drove [him] away." "I have since been in Lancashire from whence & the edge of Yorkshire I have got severall fossils w^{ch} I design to give you an account of ere long. I desire to know if Dillenius his book of mosses is publisht. I subscribed for it & paid my first subscription before I left London."

From this date we know nothing further of Massey, but it may be assumed that he never recovered his health. He died at Rostherne on March 29, 1743, and was buried in the chancel of the church there. Over him is a flagstone inscribed as follows:—

Here lieth interred the body of
RICHARD MIDDLETON MASSEY,
(son of Edward Massey, of Rostherne, Gent)
M.D. Honorary Fellow of the College of
Physicians, and Fellow of the Royal Society of London
Obiit 29mo Martii, A.D. 1743.

SHORT NOTES.

Polygala dunense Dumort.—This plant does not appear to have been separated by British botanists from *P. oxyptera* Reichb., or, if so, the records have escaped my observation. On looking over my herbarium, I find a number of examples which show the distinguishing features of this subspecies, *viz.* an oval-cuneiform capsule, distinctly shorter than and only about one-third wider than the obtuse mucronate wings. Some plants have these points less well-marked and less uniformly correlated than others. Occasionally the wings are less obtuse, or are even somewhat acute; at other times the capsule is somewhat longer, but never so long and wide as in true *oxyptera*. Examples in my collection were collected at Crosby, 1893, Churchtown, 1903, and Hall Road, 1914, all on the South Lancashire sand-dune tract (v.-c. 59); also from Lytham, 1908, and Fairhaven, 1910, in West Lancashire (v.-c. 60). A specimen distributed by the Rev. H. J. Riddelsdell from Aberafon Sands (v.-c. 41), June, 1906, seems to belong here also. Other gatherings are too young to determine with certainty.—J. A. Wheldon.

The Watsonian v.-c. Divisions of Perthshire (p. 218).—That the question of the position of Glen Falloch in the Watsonian divisions of Perthshire is by no means a new one can be seen by referring to a notice of the first discovery of *Juncus tenuis* in the county, which appeared in the *Annals of Scottish Natural History* for January, 1904. In that notice I expressed the opinion that, by Watson's own definitions, Glen Falloch was expressly excluded from West Perth, and inferentially also from Mid Perth, having apparently been forgotten by him. I then advocated that it ought to be joined to Dumbarton. Since then, however, I have considered that to take a part of one county and join it to another, on the plea that it drains into the latter, would be the beginning of a movement which would speedily overturn the Watsonian scheme as a whole, based as it is on the county as the dividing factor. It seems to me, however, that there is a very simple way out of the difficulty. Make that part of Perthshire which drains into Loch Lomond a separate division of the county of Perth, giving it Dr. B. White's name of Lomond, Perth, and allotting to it the number 87½. It would thus easily take its place amongst the Watsonian vice-counties, and all uncertainty would be at an end. I believe this is what Watson himself would have done had he not somehow quite overlooked this part of Perthshire. There is no record, so far as I know, of *Juncus tenuis* having occurred in Perthshire until it was found almost simultaneously in 1903 by Miss Armitage in Glen Falloch and by myself in East Perth. Since then it has been recorded from several parts of Mid Perth, but in all the stations in which it has been found it appears to me to bear unmistakably the stamp not of a native plant but of one which has been introduced, unwittingly no doubt, by the agency of man.—William Barclay.

REVIEWS.

The Ferns of South Africa: containing Descriptions and Figures of the Ferns and Fern Allies of South Africa. By Thomas R. Sim. Second edition. Demy 8vo, pp. x. + 384; 186 plates. Price 25*s.* net. Cambridge University Press.

This new and enlarged edition of a book which made its first appearance in 1892 shows in every way a marked advance upon its predecessor, of which a notice appeared in this Journal for 1893, p. 187. During the period that has elapsed, the author has continued his investigations: a supplement to the book was published in 1906, and this, with more recent observations, is incorporated in the volume before us. The number of species enumerated is raised to 220, as against the 179 included in the first edition; a proportionate increase is shown in the plates, which number 186 as against 158. The additions are mainly from the northern colonies, of which certain ranges, slopes and valleys, as well as the west coast, may be expected to yield further novelties. In addition to his own discoveries, Mr. Sim includes the ferns collected in Gazaland in 1906 by Mr. C. F. M. Swynnerton, enumerated by Mr. Gepp in Journ. Linn. Soc. (Bot.) xl. 237–244, and those published by Dr. J. Medley Wood in his *Handbook to the Flora of Natal* (1907), as well as information from other sources.

The nomenclature, which in the earlier edition followed that of Hooker & Baker's *Synopsis Filicum*, now follows with very little variation Carl Christensen's *Index Filicum* (1905–6), which was accepted as the authority for fern nomenclature by the Brussels Congress (1910) and to the value of which Mr. Sim pays a deservedly high tribute. The introductory chapters, reproduced in 1892 from the author's *Handbook of the Ferns of Kaffraria* (1891), are, *mutatis mutandis*, retained; in his notice of this work (Journ. Bot. 1891, 253) Mr. J. G. Baker suggested the more complete enumeration which has now been carried out so satisfactorily. The careful descriptions are accompanied by a full synonymy and a detailed geographical distribution. Four new species are described and figured: *Hymenophyllum uncinatum*, *Asplenium Eylesii*, *Pellæa Swynnertoniana* (referred by Mr. Gepp to *P. calomelanos*), and *Notholæna bipinnata*—as well as numerous varieties; *Asplenium Hollandii* is a new name for a plant originally described as a *Davallia*. The genus *Marsilia* is now represented by only one species, *M. macrocarpa*, to which the four admitted in the first edition are now reduced as "varieties or conditional forms."

The volume is admirably produced by the Cambridge University Press; we are surprised, however, that no one pointed out to the author the desirability of making intelligent use of the page-headings, which here as in the former issue run throughout the descriptive portion as "descriptions of species." It is always a matter of astonishment to us to find that head-space which, as in the various colonial floras, can be so usefully employed to indicate what is below it, should be wasted in this

way; every one who has occasion to refer to many books knows how much time is saved by useful headings. There is an excellent "systematic index" of names and synonyms, and a rather curious "general index and glossary."

Plants and their Ways in South Africa. By BERTHA STONEMAN, D.Sc., Professor of Botany, Huguenot College, Wellington, South Africa. With numerous illustrations. New edition, revised and enlarged. 8vo, cloth, pp. x. 387. Price 5*s*. Longmans.

THIS cheap and excellent volume should give a great stimulus to the study of botany in South Africa. Extensive and admirable as is the work which has already been done, there was room for such a book as this, which can be put into the hands of the many who—doubtless in South Africa as elsewhere—take an interest in botany, but are from various reasons unable to avail themselves of a work so extensive and expensive as the *Flora Capensis*, now almost completed. (It may be parenthetically remarked that the earlier volumes of this work have long been obsolete; it may therefore be hoped that the Cape Government, now that the work is practically completed, will arrange for the new issue of these earlier instalments.)

The first hundred pages of the book are devoted to the growth and structure of plants and do not materially differ from other introductory works; but the remainder, even when dealing with general matters, do so with special reference to the South African Flora; the chapter on "Plant Defences," for example, is treated entirely in this aspect, and the illustrations to that on "Flowers and their Parts" are taken from South African species. The "Classification of Plants," which may be regarded as a key to the Flora, occupies nearly 200 pages; this is arranged on Engler's system, although a condensed synopsis of Bentham & Hooker's arrangement is given for the convenience of those who have access to the *Flora Capensis*. A key is given to the genera of each order, which are briefly described, with occasional notes as to locality, &c. There is an excellent index—only one, we are glad to say.

The book, which is beautifully printed and fully illustrated—there are 354 figures in the text—is very cheap at 5*s*. The only defect we notice is the absence of a glossary; many of the technical terms, however, are included in the index.

Field-Book of American Trees and Shrubs: a Concise Description of the Character and Color of Species common throughout the United States, together with Maps showing their General Distribution. By F. SCHUYLER MATHEWS. With numerous Reproductions of Water-colour, Crayon, and Pen-and-Ink Studies from Nature by the Author. Foolscap 8vo, cloth pp. xvii. 465. Price 7*s*. 6*d*. net. London & New York: G. P. Putnam's Sons.

THE contents of this very conveniently pocketable volume are sufficiently indicated by the title, but a few words may be added

to show that the promise set forth is adequately fulfilled. The basis of the work is scientific, the system followed being that of Engler & Prantl; the descriptions, written in language as untechnical as possible, are adequately long. Its aim, however, is not merely to aid in the identification of species; Mr. Mathews writes also "to demonstrate certain truths relative to form and color which are more within the province of the artist than the botanist and which naturally do not appear in text-books on botany. A particular tree, for instance, possesses a typical figure and a tone of green different from that of its associates," and "there is no reason," says Mr. Mathews, "why these should not be described with as much exactness as possible." The chief difficulty in doing this is to find words adequate to defining the various shades of green, evident enough to the observer but difficult to express; the author, however, has certainly overcome this as far as possible. The distribution of each species is given at considerable length. The coloured plates are good; those printed entirely in green are less satisfactory. These represent the whole tree or shrub, but there are numerous others on which for the most part one or two leaves (or even a portion of a leaf), usually with a fruit, are represented, three or four species being combined on one plate. These, although doubtless accurate as far as they go, strike us as scarcely adequate: the leaves of many of the species of *Cratægus*, for example, are scarcely distinguishable one from the other, and in any case it can hardly be supposed that the foliage of a tree conforms throughout to one pattern. The author, however, attaches much attention to the question of leaf-form, and gives a useful plate of diagrams showing the "exact terms for geometrical figures," urging upon his readers that "form must be described with scientific accuracy and not according to popular usage": colours also should be distinguished in a scientific way.

The Introduction, from which these extracts are taken, contains much that is worth reading. Perhaps the oddest thing in it is the announcement that, as "our common blackberries are not yet perfectly understood, it seemed wisest to exclude them altogether from the book," and this has been done so thoroughly that *Rubus* does not appear in the index. Keys are provided for the identification of species by the leaves and of trees by the character of the bark—this latter is illustrated.

The nomenclature is in accordance with the Vienna Code—"at least it is intended" to be so—and the author expresses himself somewhat strongly with reference to the independent attitude taken up by some of his contemporaries. "It is deplorable," he says, "that some American botanists do not abide by this internationally supported standard, but I presume they have their own excellent reasons for not doing so. In any event, it is perfectly apparent that a difference like this promotes confusion and retards progress: indeed progress is often retarded in all professions by just such unwillingness on the part of the individual to be insubordinate. Meanwhile, if we should pick up

the work of, say, three botanical authors and find they contain as many different scientific names for one species, we think we are justified in indulging in a few expressions not altogether complimentary to two out of the three writers."

We are glad to see this much-needed protest, as it shows—as indeed we know to be the case—that many, and those not the least important, American botanists are not in accord with the anarchical methods which have practically rendered the work of the Vienna Congress ineffective. It was certainly supposed by those who were mainly responsible for the assembling of that gathering that at least folk who took part in it would consider themselves bound by the conclusions arrived at: but this supposition has been falsified, not only in America but to some extent in this country, by those who prefer to follow their own course rather than to subordinate their individual opinions to the *consensus* of the majority.

Among the more objectionable of the American innovations is the introduction of a trinominal system of nomenclature, which indeed seems to be the logical outcome of the method of naming adopted by Dr. Moss, set forth and justified in *The Cambridge British Flora* (Introduction, p. xvii.). The American method seems to have arrived at the climax of absurdity in a paper on Michigan *Liliaceæ* in the *Bulletin of the Torrey Club* for June last, where, as the result of ignoring the Vienna list of *nomina conservanda* and of the new trinominal nomenclature we have *Unifolium bifolium monophyllum* and *Unifolium bifolium trifolium* as forms of *Unifolium bifolium*; the former, a new creation, "differs from the species *only* in having but one leaf on the stem," the latter has three leaves. Whether such variation is entitled to a distinctive name will be doubted by those who know the variability of *Paris quadrifolia* in this respect.

But we have been led away from Mr. Mathews's book, which we commend as a useful and handy volume.

Bartram's Garden, Philadelphia, Pa. By Elizabeth O. Abbot, Foundation Member, Botanical Society of Penna: Member John Bartram Association. Issued by the John Bartram Association, March, 1904. Re-issued, 1915.

The library of the Department of Botany of the British Museum has been enriched by a copy of this interesting little book through the kindness of Miss Carlotta Heering-Browne, who has for some time devoted herself to the preparation of an exhaustive biography of Bartram. The most interesting feature of the book is perhaps the plan of the garden as it existed in 1907 (and still exists), with figures indicating the position of the principal objects of interest, and notes upon each, including the trees planted by Bartram himself. The garden was established, it is suggested, in 1730: "for a hundred years [it] was in Bartram hands; there followed years of cherishing in other hands; then came a period of neglect and the threat that the growing city would encroach upon it to its extinction; happily

for Philadelphia and the world, the descendants of Bartram, with sympathetic help from Thomas Meehan, then a member of the city council, secured the purchase of the garden by the city of Philadelphia for a public park."

The sketch of Bartram, considered chiefly in relation to his garden, includes extracts from Washington's *Memorials* (1849)—a storehouse of information rendered almost useless by the absence of an index—in which is included his correspondence with Collinson, Philip Miller, John Clayton, Benjamin Franklin, Kalm, Gordon, Sloane, James Logan, Dillenius, and others. The book contains a photographic reproduction of a letter from Bartram to Fothergill, lettered "the original is now in South Kensington Museum herbarium," by which is intended the Department of Botany: this is one of seven there preserved, with much other interesting Bartram material, including two volumes of the Sloane Herbarium (332 and 334) of plants collected by Bartram, with labels in his hand. The Department also contains Collinson's MS. "Account of the introduction of American seeds into Britain" (1766), the collection and transmission of which by Bartram is mentioned by the writer of the little book.

A reference may be made here to a very interesting account of Bartram with which American botanists are doubtless familiar, but which is not, we think, generally known in this country. This appears in the *Letters of an American Farmer*, first published in 1782, by J. Hector St. John de Crèvecœur (1735–1813), a Norman who settled in Ulster County, New York. In this a chapter is devoted to a letter "from Mr. Iw—n Al—z, a Russian gentleman; describing the visit he paid at my request to Mr. John Bertram, the celebrated Pensylvanian Botanist." The account of Bertram—the name is so spelt throughout—fully confirms the universal impression of his admirable character and integrity, as well as of his botanical knowledge and horticultural skill. The editor of the edition published in London and New York in 1908 suggests that the "Russian gentleman" had no real existence, but was probably Crèvecœur himself.

BOOK-NOTES, NEWS, &c.

Our attention has been called to a reissue of Anne Pratt's *Wild Flowers of the Year*, by the Religious Tract Society, which from a bibliographical standpoint demands a word of protest. Issued in 1913, there is nothing in the "Foreword" to intimate that this is not a new book: it was, however, first published by the R. T. S. as a shilling volume in or before 1860, in which year we possessed a copy: the author died in 1893. The little book was in its time quite useful: it is now, of course, both in manner and matter entirely out of date. Yet more unsatisfactory are the illustrations, taken (although this is not indicated) from some popular German book: of the ninety-six figures, "selected, described in an appendix, and indexed by the Rev. Professor George Henslow," sixteen are of foreign plants, "allied," says the

Foreword, "to English species," but nowhere mentioned in the text—a remark which also applies to many of the British species figured: no reason is given for the inclusion of the foreign plants. The text is arranged according to the months: the plates follow the arrangement of the *Student's Flora*, and are thus dissociated from the text, save for a reference in the index, which, by the way, is far from complete. The text contains misprints—*e. g.* "Aceras anthropophera" (p. 84)—which we do not think were in the original issue, and at least one of the figures—that lettered "Luzula sylvatica"—is inaccurately named, both on the plate (xliv.) and in the appendix. We cannot refrain from expressing surprise that a body of the standing of the Religious Tract Society should publish a book in every respect so unsatisfactory.

Light-flashes from Flowers.—In a pamphlet issued by Messrs. G. Fischer (Jena, 1914, 8vo, pp. 1–53, 1 fig.) F. A. W. Thomas discusses the light-flashes of flowers at twilight which were observed by Linnæus's daughter Elizabeth, and have also been described by Goethe and others. These appearances are to be ascribed to optical illusion. The structure of the outer part of the retina renders it sensitive to different intensities of light but not to colour; the fovea, *i.e.* the centre of the yellow spot, on the other hand, is the region of keenest perception of colour; therefore, when in a certain degree of twilight the image of a red flower moves from the peripheral parts of the retina to the fovea, the red colour appears to become more vivid. At the same instant the waves of light approach the length for producing maximum activity in those parts of the retina specially adapted to darkness, so that a distinct reflection of the background of the flower is perceived, and this combines with the more vivid perception of red to give an impression of lightning. This impression is intensified if the fading light is bluish-green in colour.

The Journal of the Linnean Society (xliii. no. 288) issued May 15 contains papers on the Structure of the Wood of Himalayan Junipers, by W. Rushton; a contribution to the Flora of Fiji by W. B. Turrill, containing numerous new species discovered by Sir Everard im Thurn in 1905-7; a paper on the Vegetation of White Island, New Zealand, by W. R. B. Oliver, and on *Tristichaceæ*, by Mr. J. C. Willis, who regards *Tristicha*, hitherto referred to *Podostemaceæ*, as the type of a new natural family.

The Journal of the Department of Agriculture for Ireland issued in April last contains two important contributions by Dr. G. H. Pethybridge—"Investigations on Potato Diseases" and on "Cultivation of Seaweed in Ireland." Each is fully illustrated and should have an important bearing on the development of Ireland's industrial resources. There is also a report of the 1914 experiments on Tobacco-growing in Ireland—a subject which received attention as long ago as 1830, when a treatise on the Tobacco Plant was published by Thomas Brodigan (d. 1849), who had studied tobacco-growing in America in 1817.

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THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN

EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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THE JOURNAL OF BOTANY was established in 1863 by Dr. Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of general Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains. In 1896 it became necessary to increase the size of the Journal, owing to the number of papers sent for publication: the number of plates was at the same time augmented.

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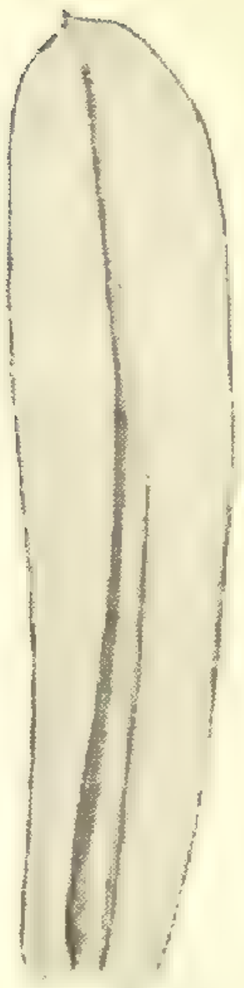
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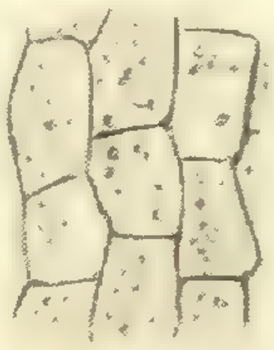
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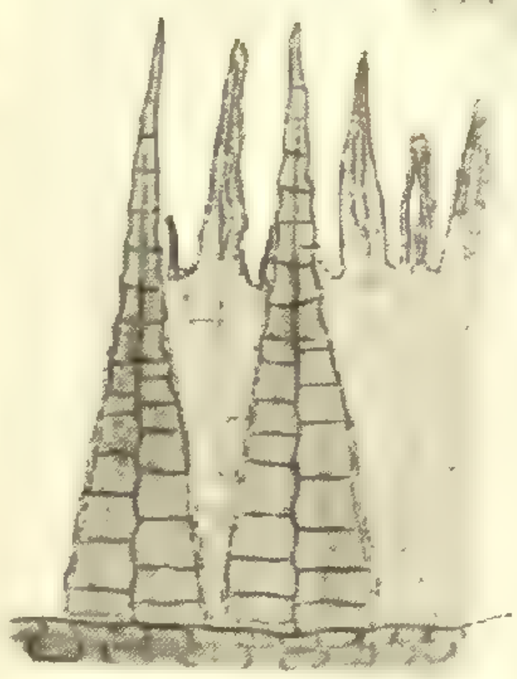
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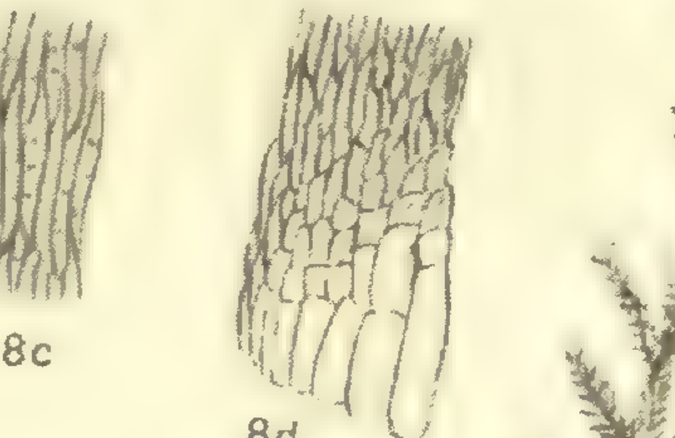
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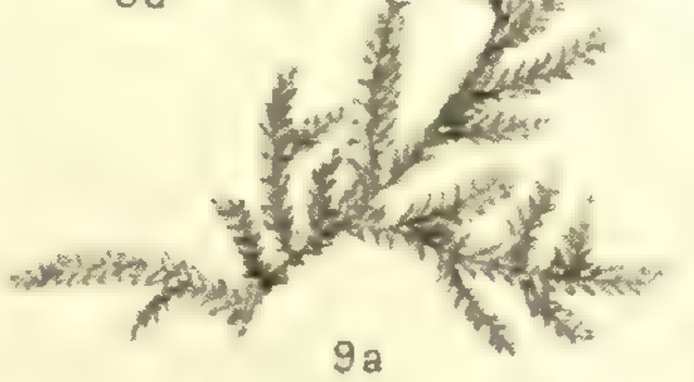
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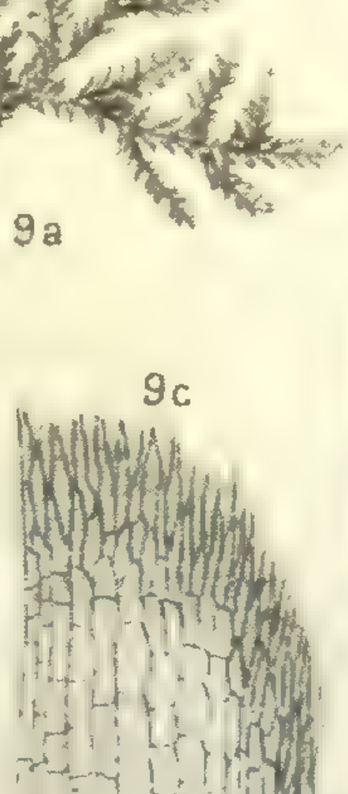
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CEYLONESE MOSSES.

CEYLONESE MOSSES

Collected by the Rev. C. H. Binstead in 1913.

By H. N. Dixon, M.A., F.L.S.

(Plate 540.)

Considering the extent and interest of the bryological flora of Ceylon, there has been comparatively little published on it. Since Mitten's Musci Ind. Or. in 1859, the only papers of importance known to me are C. Müller's description of Nietner's collections in *Linnæa*, 1869, with about thirty new species, Mitten's "New Species of Mosses collected in Ceylon by Dr. Thwaites" (seventy-four new species), and Hampe's paper on Beccari's collections (six new species), both in 1872; and quite recently a paper in *Hedwigia* (L. p. 115) by Dr. Herzog, "Beiträge zur Laubmoosflora von Ceylon," containing an account of mosses collected by him in 1906. The late T. W. Naylor Beckett collected mosses in Ceylon, but did not publish any account of them; many of his gatherings are recorded, however, in Max Fleischer's *Musci der Flora von Buitenzorg*, with others collected by the author himself.

Mr. Binstead's visit was paid during February and March of 1913. Owing to topographical and other considerations, recent collectors have covered very much the same ground, Nuwara Eliya and the mountain Pedrutalagala* (a name which rejoices in as many variations in spelling as it does in syllables!) figuring largely in all the accounts, while Kandy and the Peradeniya Gardens are almost equally prominent. In spite of this, however, each collector has succeeded in adding a considerable number of new species to the flora. Thus, Herzog describes fifteen new species in the paper referred to, while the present paper contains another decade.

The greater part of the collections made by Mr. Binstead, over four hundred numbers in all, were from Nuwara Eliya and Pedrutalagala; some from Kandy and the neighbourhood, a few from Udapassellawa, about thirty miles from Nuwara Eliya, and a few from Nanuoya.

The collection comprises as nearly as possible two hundred species; it may be mentioned that Dr. Herzog's list contains almost exactly the same number, and that just one hundred species are common to both lists.

I have to acknowledge valuable assistance from Dr. Brotherus in the determination of some of the critical species.

Dicranaceæ.

Trematodon ceylonensis C. M. Stony ground in open, near waterfall, N. E., *c. fr.* (242); stony bank near Ragala, Udapassellawa, *c. fr.* (392).

---

* I have used the abbreviation *Ped.* for the mountain in the following enumeration, and *N. E.* for Nuwara Eliya.

Trematodon (§ Gymnotrematodon) **brevisetus** Dixon, sp. nov. (Pl. 540, fig. 1.) E minoribus generis. Caulis brevis; folia superiora longiora, subcomosa, suberecta vel patula, sicca subcrispata; e basi lanceolata concava sensim in subulam angustata, 2–3 mm. longa, margine subplano, apice *plerumque subdenticulato*, nervo percurrente vel sæpe excurrente; cellulæ basilares laxæ, circa 3 × 1–5 × 1, superiores *elongatæ*, 3–4 × 1, 6–8 μ latæ, *pellucidæ*.

Seta *brevis*, 6-8 mm. (cum theca) longa, stramineo-viridis, flexuosa; theca pallide fusca, elliptica, *circa 1 mm. longa*, operculo subæquilongo vel breviore, oblique subulato, collo *paullo longiore*, leniter curvato, basi plus minus distincte strumoso. Annulus latus, haud separabilis. Peristomium *nullum*. Exothecii rete ei *T. Schmidii* simile, sed parietibus incrassatis. Spori 16–20 μ, tenuiter punctulati, lutei.

Hab. Nuwara Eliya, February, 1913 (86).

A specimen of this was sent to Dr. Brotherus, who named it *T. ceylonensis*, and wrote later that he had found a peristome present. There must have been some admixture, for the material I have shows no trace of peristome whatever in either old or young capsules; moreover, the areolation of the leaves is quite distinct, the upper cells in *T. ceylonensis* being shorter, 2 × 1 or subquadrate, and the leaf apex usually denticulate for some distance down. Here the upper cells are larger, and about 3 × 1, the leaf apex subentire, or denticulate only at point. *T. Schmidii* differs in the leaf apex very narrow, acute, and entire, the upper cells shorter, the capsule neck only equal to or shorter than the capsule; the spores, according to Roth, also are larger (20–30 μ) in *T. Schmidii*, but I have found them about 15–20 μ in that species.

The short seta and short gymnostomous capsule at once separate it from the other Indian species.

Ditrichum flexifolium (Hook.) Hampe. Syn. *D. plicatum* (Mont.) Hampe. *D. difficile* (Duby) Fleisch.

Sandstone rock by road to Hakgala, N. E., *c. fr.* (63); N. E., *c. fr.* (245).

I have elsewhere given reasons (*cf.* Journ. Bot. 1913, p. 324) for considering the South Indian and Ceylonese moss as identical with the widely distributed *D. flexifolium*.

D. amœnum (Thw. & Mitt.) Par. Roadside rock near N. E., *c. fr.* (46, 47); sandstone rock by road to Hakgala, N. E., *c. fr.* (63*a*). The last-named specimen was apparently growing associated with *D. flexifolium*; the imperfect peristome seems the only character by which it is separable.

Dicranella brasiliensis (Duby) Broth. Syn. *D. pomiformis* (Griff.) Jaeg. *Microdus pomiformis* Fleisch.

Stony bank by roadside, Udapassellawa, *c. fr.* (396, 400).

Thériot (in Bull. Herb. Boiss. vii. 1907, p. 277) has shown that *Didymodon pomiformis* Griff. is identical with Duby's *Weisia brasiliensis*.

D. edentata Thw. & Mitt. Stony bank, Udapassellawa, *c. fr.* (398).

Campylopodium khasianum (Griff.) Par. On peat in open, N. E. (85); roadside rock by way to Hakgala, N. E. (88); roadside rocks, N. E. (237, 238); sandy bank in glen near waterfall, N. E. (246); stony ground near Udapassellawa (393); all *c. fr.*

Braunfelsia scariosa (Wils.) Par. Trees, 7000 ft. and 8000 ft., Ped., *c. fr.* (56, 250).

Dicranoloma leucophyllum (Hampe) Par. var. *Kurzii* Fleisch. Trees by waterfall, N. E., *c. fr.* (50, 240).

Leucoloma nitens (Thw. & Mitt.) Par. Ped., 8000 ft. (42). bough of tree in shade, N. E. (48, 49); dead bark of post, N. E. (61); trees in jungle (247, 249).

L. amœne-virens Mitt. Damp shaded rock below waterfall, N. E. (239); shaded rock in stream, N. E. (244, 248).

Campylopus comosus (Hornsch. & Reinw.), Bry. Jav. N. E. (243).

Forma *minor* Fleisch. Roadside bank, N. E., *c. fr.* (41); foot of tree by road, N. E. (236).

C. Goughii (Mitt.) Jaeg. Rocks, stony bank in shade, trees and rotting wood, Ped., *c. fr.* (54, 55, 60).

C. ericoides (Griff.) Jaeg. Rotten stump in jungle, N. E., *c. fr.* (66); stony ground, Udapassellawa, *c. fr.* (394, 395).

C. nilghiriensis (Mitt.) Jaeg. Shaded rock at 8000 ft., Ped., *c. fr.* (64).

C. subtricolor Lor. Base of tree, N. E. (51).

C. aureus Bry. Jav. Jungle, N. E., male (59); peat in open place, N. E., male, a small form (81); base of tree, N. E. (51), a rather doubtful plant.

C. caudatus (C. M.) Mont. Old rhododendron tree near lake, N. E., *c. fr.* (52).

This species has not been recorded from Ceylon, but its distribution (Neilghiris, Java, and eastward) would lead one to expect it here. Mr. Binstead's plant agrees very closely with No. 108, Fleischer, M. Fr. Archip. Ind., only differing in having the nerve rather wider (but it is variable in both plants). The nerve section agrees in both, and is rather peculiar; Fleischer describes the cells of the ventral layer as *wide*, but I do not find them so in his No. 108, but small, substereid to stereid; and the species is placed by Brotherus under *Palinocraspis*.

C. subulifolius Thw. & Mitt. Shaded rock near waterfall, N. E., *c. fr.* (44, 370); do., *st.* (231, 384). A very beautiful species, with stems four inches and more high and long glossy leaves, and with stout, dark pachydermatous capsules having stoutly beaked lids, on scarcely curved setæ.

Microcampylopus subnanus C. M. Sandy bank by roadside, N. E., *c. fr.* (45).

Nov. var. ELATUS Dixon. Caules, et masc. et feminei, elongati, 1–2 cm. alti; folia (fol. perichætialibus et perigonialibus exceptis) multo breviora, sicca erecta, adpressa.

Hab. Sandy bank, N. E., *c. fr.* (297).

Fleischer maintains this genus, rightly I think, separate from *Campylopus*, placing it next to *Campylopodium*; he remarks that

M. subnanus is scarcely separable from the African *M. nanus* C. M., and that the genus is closely allied to *Campylopus*. I am inclined to think it much more nearly allied to *Campylopodium* (from which it scarcely differs generically except in the almost smooth capsule and the absence of stomata from the capsule wall), and doubtfully separable as a genus.

The spores in *C. subnanus* are very remarkable, though the peculiarity almost disappears after desiccation. Each spore consists of a central opaque spherical part, which is covered with large but low mammose translucent tubercles; when viewed by transmitted light, only those in the horizontal plane are rendered visible as an equatorial ring, through their translucency, and this gives the spore the appearance of being surrounded by a ring of pellucid tubercles (*cf.* Pl. 540, fig. 2).

The variety is very marked in size and habit, as well as in the very short leaves; it may quite probably be a distinct species.

Thysanomitrium nigrescens (Mitt.). Roadside rock and bank, N. E., *c. fr.* (43, 232, 234, 241).

T. Blumii (Doz. & Molk.). Summit of One-tree Hill, 7000 ft., N. E., male, and sterile female (53). Is there any real difference—apart from colour—between these two species? Both are extremely variable in size and habit, and in both the hair-point varies considerably. In any case *T. Thwaitesii* (Mitt.) appears to me inseparable from *T. Blumii*.

Dicranodontium sparsum Dixon, sp. nov. *Pergracile*, caules *gregarii*, haud cæspitosi, 1–2 cm. alti, infra rufo-fusci, haud radiculosi, supra pulchre *saturate virides*; folia erecto-patentia, sericea, *haud falcata*, laxiuscula, superiora longiora, 5–7 mm. longa; e basi brevi (circa $\frac{1}{5}$ folii longitudinem occupante), ima dilatata, vaginante, canaliculato-concava, cito in subulam setaceam flexuosam prælongam, *e medio folio densiuscule serrulatam*, dorso sublævem attenuata. Costa valida, $\frac{1}{4}$–$\frac{1}{3}$ fol. latitudinem apud basin æquans, supra pessime notata, totam subulam fere occupans, atque longe excurrens. Cellulæ superiores *elongatæ, angustissime lineares*, valde chlorophyllosæ, basilares omnes elongate rectangulares, juxtacostales infimæ latiores, laxiusculæ, 6–8 μ latæ, marginem versus sat abrupte angustatæ angustissimæ, limbum latiusculum formantes, omnes chlorophyllosæ; alares magnæ, teneræ, hyalinæ, auriculas distinctas fugaces instruentes. Cetera ignota.

Hab. Shady bank near waterfall, N. E. (383).

A very delicate, bright green plant, growing among other mosses. Only a small quantity was found, and it may be that its true habit may not be fully shown, and the plant be normally more cæspitose. Apart from this, however, and the general delicacy of its growth, it has good structural characters. Most of the other Indian species are distinguished at once by either their robust habit, falcate-circinate leaves, or the entire or subentire subula. *D. asperulum* differs in the much shorter upper cells, and in the leaves serrulate from near the base. *D. dimorphum* Mitt., from North India, has the leaves subentire. *D. ceylonense* Fleisch., ined., is much more cæspitose in habit, and has the leaves nearly entire.

Leucobryaceæ.

Leucobryum javense (Brid.) Mitt. Shaded bank of waterfall, near N. E. (73).

L. Bowringii Mitt. Side of stream, N. E. (75); tree in jungle, below large waterfall, N. E. (251).

L. neilgherrense C. M. Pedrutalagala (230).

Leucophanes glaucescens C. M. Palm stem, Peradeniya Gardens (15).

Octoblepharum albidum (L.) Hedw. Palm stem, Peradeniya Gardens (3).

Fissidentaceæ.

Fissidens Schmidii C. M. Peaty roadside bank, N. E. (89); shaded stone, foot of Ped. (259).

Fissidens (Bryoidium) **aberrans** Broth. & Dixon, sp. nov. (Pl. 540, fig. 3.) Dioicus, fl. masc. plures ad basin surculorum sterilium. Fl. masc. minutissimus, paucifolius, cauli perbrevi terminalis. Gracilis, humilis, laxe cæspitosus, *pulchre viridis*. Caules *dimorphi*, fructiferi *minuti*, *perbreves*, *paucifolii*, steriles *longiores*, 3–5 mm. longi, *plurijugi*, *foliis æqualibus regulariter plumosi*. Folia minima, circa ·5 mm. longa, *stricta*, *sicca minime mutata*, *paullo contracta*, anguste oblongo-lanceolata, breviter acuminata, *acutissima*; lamina vaginalis circa $\frac{2}{3}$ fol. longitudinem æquans, lam. dorsalis infra *perangusta*, plerumque supra basin evanida; costa validiuscula, *concolor*, *subpercurrens*. Limbus totam folium fere cingens, in lamina vaginali sat validus, ceterum angustus, viridis, apud folii apicem sæpe evanescens. Rete *laxum*, e cellulis chlorophyllosis vel pellucidis sat magnis, *irregulariter rhomboideo-hexagonis*, 68 μ latis, lævibus, parietibus *angustis*, instructum, lamina vaginali *elongatis*, *plerumque rectangularibus*, valde chlorophyllosis. Seta terminalis, perbrevis. Cetera nulla.

Hab. Peaty roadside bank, half-way to Hakgala, N. E., cum setis (89).

Differs from *F. Schmidii* and the other Indian species of *Bryoidium* in the habit, the leaves scarcely altered in drying, and the lax areolation, much longer in the vaginant lamina. The areolation, and the nerve and border scarcely prolonged to the apex separate it from *F. Zollingeri*.

F. Beckettii Mitt. has apparently no distinct sterile stems, the leaves much larger with stout excurrent nerve and very lax areolation.

F. pennatulus Thw. & Mitt. Bank of shaded brook, N.E. (252); shady bank of stream, Rombodde Pass (254); stone in shade by stream, Udapassellawa, *c. fr.* (402).

F. virens Thw. & Mitt. (*F. asperifolius* Broth. & Fleisch.). Kandy (13). I have carefully compared *F. asperifolius* (No. 12, Fleischer, Musc. Fr. Arch. Ind.) with the type of *F. virens* at Kew, and I do not find the differences pointed out by Fleischer sufficiently constant to warrant its separation as a species. The lid varies in its length, relative to the length of the capsule, in

both, in *F. virens* being sometimes equal to the capsule, sometimes markedly shorter. Nor can I find any difference in size of plants, direction and width of leaf, or height of papillæ. Moreover, Mr. Binstead's plant combines the characters of the two, as given by Fleischer, having the slightly smaller size assigned by that author to *F. virens*, but the capsule lid equalling the capsule in length.

F. ceylonensis Doz. & Molk. Kandy (16).

F. Zippelianus Doz. & Molk. Shaded sandstone rock, Kandy, *c. fr.* (7).

F. angustus Thw. & Mitt. I picked out a few stems of this apparently rare species from No. 388, *Camptochæte thamnioides*, growing on wet rocks by water, Nuwara Eliya.

F. nobilis Griff. Damp recesses of rock near waterfall, N. E. (258).

F. anomalus Mont. Rotting bark in deep shade by stream, Hakgala (91); tree in jungle below waterfall, N. E., *c. fr.* (253, 255); shaded rock by stream, Rombodde Pass, *c. fr.* (256); mossy tree, 8000 ft., Ped., *c. fr.* (260).

F. gedehensis Fleisch. Roadside rock, half-way to Hakgala, N. E. (92). Agrees well with No. 22, Fleischer, M. Fr. Arch. Ind., except in having the leaves slightly broader and somewhat more crisped when dry. It has been referred to *F. gedehensis* by Dr. Brotherus.

Calymperaceæ.

Syrrhopodon strictus Thw. & Mitt. Tree-stump in ravine, and shaded rock near waterfall, N. E. (70, 118).

Calymperes Dozyanum Mitt. Kandy (2).

C. Fordii Besch. Peradeniya Gardens, Kandy (8, 9). I have given elsewhere (in a paper read before the Linnean Society, not yet published) my reasons for considering *C. Fordii* Besch. and *C. Thwaitesii* Besch. inseparable from one another. Mr. Binstead's No. 9 at least, if the two were kept separate, would have to be referred to *C. Fordii*.

Pottiaceæ.

Hymenostomum edentulum (Mitt.) Besch. Shaded sandstone rock, Kandy, *c. fr.* (6).

Weisia viridula (L.) Hedw. Shady sandy bank, N. E., *c. fr.* (67, 262); roadside bank, near Ragala, *c. fr.* (399).

Trichostomum cylindricum (Bruch.) C. M. Roadside bank, near N. E. (78); damp vertical roadside rock, half-way to Hakgala (84); trees, Ped., 7000 ft., *c. fr.* (250*a*).

T. angustatum (Mitt.) Broth. Tree in wood near church, N. E. (266).

T. duriusculum (Mitt.) Broth. Dry rock in open, N. E., *c. fr.* (68); dry rock, Ped., *c. fr.* (82); tea bush, N. E. (90); boulder in stream under Ped. (265, 267).

Hyophila cylindrica (Hook.) Jaeg. Open stone in tea garden, Udapassellawa, *c. fr.* (401). This is somewhat intermediate between *H. cylindrica* and *H. stenocarpa* Ren. & Card., which is perhaps hardly specifically distinct.

H. spathulata (Harv.) Jaeg. Kandy (5).

H. Micholitzii Broth. var. *sterilis* Fleisch. Roadside rock, N. E. (263); a very tall, robust, sterile plant, which I think is referable here.

Barbula javanica Doz. & Molk. Brick by roadside gutter, Peradeniya Gardens, Kandy, *c. fr.* (14).

? *Barbula* sp. An undetermined plant from Kandy (1), near *B. inflexa* (Duby), but differing in the wider, thin-walled basal cells, leaves narrower, especially above, and not inflexed and tubular near apex, and a stouter nerve. Dr. Brotherus writes, "Barbula seu Trichostomum ? Species mihi ignota."

Grimmiaceæ.

Grimmia ovata Web. & Mohr. Boulder in open, N. E., *c. fr.* (65).

Rhacomitrium javanicum Doz. & Molk. in Zoll. Enum. System. Verzeichn., p. 32 (1854). Rock near Cascade, N. E. (72); boulders in stream, foot of Ped. (83); Ped., 8000 ft. (93).

Var. *molle* Broth. apud Herzog in Hedw., L., 127. Cairn at summit of Ped., 8294 ft. (62). This agrees with the brief diagnosis of Herzog's plant, "Molle; folia haud subsecunda, longius pilifera," and is moreover from the same station. No. 93 is intermediate between the type and variety, while No. 83 has the long hair-points of the var., but the rigid habit and often subsecund leaves of the type.

Cardot has identified *R. javanicum* with *R. subsecundum* (Hook. & Grev.) Mitt. *Trichostomum subsecundum* Hook. & Grev. is, *fide* Paris, a MS. name, and the publication dates from the Musc. Ind. Or., Feb. 21st, 1859, as *Grimmia subsecunda* (Hook. & Grev.) Mitt. This name, therefore, antedates the name *R. javanicum* in the Bry. Jav., which was issued in August, 1859. But this was not the actual publication of *R. javanicum*, though so cited in Par. Ind. ed. ii. The first publication was in Zollinger's *Systematisches Verzeichniss der im indischen Archipel in den Jahren 1842–1848, gesammelten . . . Pflanzen*, iv., 2, Zurich, 1854. The name is given as a *nomen nudum* on p. 25, but a full description by Dozy and Molkenboer is given on p. 32, and this name must therefore have priority over *Grimmia subsecunda* Mitt.

Orthotrichaceæ.

Zygodon tetragonostomus A. Br. On branch of gorse, N. E., *c. fr.* (77); foot of Ped., *c. fr.* (95). I do not think it has been noticed that the calyptra in this species is generally sparsely pilose.

Z. intermedius Br. & Schimp. Trees near church, N. E., *c. fr.* (87); cedar, foot of Ped., *c. fr.* (197).

Z. Reinwardtii (Hornsch.) A. Br. Tree, N. E., *c. fr.* (74).

Macromitrium Perrottetii C. M. On *Berberis*, The Park, N. E., and trunk of cedar, N. E., *c. fr.* (101, 270).

M. hispidulum Thw. & Mitt. Rotting wood in shade by stream, near Hakgala, *c. fr.* (178*a*); base of tree, Nanuoya (423).

M. fasciculare Mitt. Tea bush, &c., N. E., *c. fr.* (99, 100, 268).

M. sulcatum Brid. Roadside rock, half-way to Hakgala, N. E., *c. fr.* (94), a form with short capsules; roadside, N. E., *c. fr.* (96). This seems equally at home on rocks and trees.

M. ceylanicum Mitt. Tree, 8000 ft., Ped., *c. fr.* (98).

M. fulvum Mitt. Roadside, N. E. (58); mossy bank, in thin jungle, N. E. (71); damp vertical sandstone rock by road, half-way to Hakgala, N. E. (80); roadside bank, Rombodde Pass, *c. fr.* (269); tree, Ped. (271). This fine species appears frequently to occur as a purely terrestrial moss, a very unusual condition in *Macromitrium*.

Macromitrium (Eu-macromitrium § Leiostoma) **assimile** Broth. & Dixon, sp. nov. (Pl. 540, fig. 4.) *M. japonico* Doz. & Molk. affine; caules dense cæspitose aggregati, humiles, subrobusti; rami *perbreves*, vix 3 mm. longi, densifolii; folia siccitate conferte incurvo-crispata, 2 mm. longa, *late oblongo-lingulata*, apice rotundo, *brevi-apiculato*; costa sat angusta, *in apiculum desinens*; cellulæ superiores seriebus longitudinalibus regulariter dispositæ, circa 8 μ latæ, *sat distinctæ*, breviter papillosæ, infra parum elongatæ, infimæ tantum anguste breviter rectangulares, pallidiores, suprabasilares breviter papillosæ. Seta circa 1 cm. longa, calyptra dense pilosa; theca elliptica, sicca leniter plicata.

Hab. Sunny rock, Udapassellawa (405).

Closely allied to *M. japonicum* (*M. spathulare* Mitt.), but essentially different in the apiculate leaves, which are also wider, and with less obscure upper areolation.

Funariaceæ.

Physcomitrium japonicum (Hedw.) Mitt. Syn. *P. pulchellum* (Griff.) Mitt.

Gritty soil of bank, Udapassellawa, *c. fr.* (404).

I am unable to separate *P. pulchellum* by any satisfactory characters from *P. japonicum*. There is little in the descriptions to suggest any difference; the leaves are described as "subentire" in *P. pulchellum*, and as "entire" in *P. japonicum*; but Cardot says of *P. subacuminatum* Broth. (which its author later reduced to *P. japonicum*) that the leaves are "à bords entiers ou à peine sinués," so that the leaves in *P. japonicum* are not absolutely entire always. The setæ vary in length considerably, and no character can be drawn from that feature. The number of rows of transversely compressed cells at the capsule orifice is in a plant of Griffith's from Bhotan 4–5, while in Maingay's Japanese gathering of *P. japonicum* it is only 2–3; but in Thunberg's single specimen at Kew of *P. japonicum* it appears (so far as can be judged from the lens) to be broader. Some of Mr. Binstead's Ceylon plants might be the twin brothers of Thunberg's Japanese specimen in habit and appearance. *P. japonicum* is recorded from Hong-kong, as well as from Japan, so the geographical distribution does not present any great objection to the union of the two.

Funaria Buseana (Bry. Jav.) Broth. Sandy bank, N. E., *c. fr.* (114).

F. Beccarii (Hampe) Par. Peaty ditch near lake, and road-

side bank, N. E., *c. fr.* (112, 117); roadside bank by watercourse, Hakgala, *c. fr.* (121).

F. hygrometrica Sibth. N. E., *c. fr.* (122).

Bryaceæ.

Orthodontium brevicollum Fleisch. Rotting log, Ped., *c. fr.* (281).

? *Pohlia flexuosa* Hook. Wet gravel bank by roadside, N. E., *c. fr.* (275, 299). While very closely resembling the North Indian plant, these have axillary gemmæ of quite different nature, being small, brown, subspherical, multicellular bodies, and may belong to a different species.

Brachymenium exile (Doz. & Molk.) Bry. Jav. Peaty soil, N. E., and sandy bank, N. E., *c. fr.* (97, 282); roadside sandstone rock, N. E., *c. fr.* (279).

B. nepalense Hook. Trees, N. E., *c. fr.* (103, 110, 111, 276).

B. leptostomoides (C. M.) Schimp. Fallen tree boughs, Peradeniya Gardens, Kandy (12).

Anomobryum cymbifolium (Lindb.) Broth. Sandy soil by roadside, Rombodde Pass, *c. fr.* (278). Peristome with long cilia, which are, however, not at all appendiculate. Another specimen (69) differs considerably in the wider, less vermicular cells, but is scarcely determinable.

Bryum argenteum L. Dry stony bank, N. E., *c. fr.* (273).

B. nitens Hook. Kandy, *c. fr.* (11, 34).

B. porphyreoneuron C. M. Rock in stream, N. E., *c. fr.* (274, 277).

B. pseudo-alpinum Ren. & Card. Damp hollow of bank, N. E. (289). If the Himalayan moss which Mitten identified with *B. alpinum* is also—as indicated by Mitten—the *B. teretiusculum* of Hooker, it would seem that the latter name should be adopted, and that Renauld and Cardot's new name was unnecessary.

Bryum (Eu-bryum § Doliolidium) **ceylonense** Broth. & Dixon, sp. nov. (Pl. 540, fig. 5.) *B. Montagneano* C. M. affine; differt foliis *longius tenerius aristatis*, pilo minus stricto, denticulato, foliorum superiorum sæpius *hyalino*; cell. superiores angustæ, parietibus subincrassatis; basilares *magnæ*, parietibus tenuibus. Theca paullo longior, angustior, senectute *fusco-purpurea*, operculo obtuso, peristomio melius evoluto. Peristomii dentes externi rufo-fusci, superne *parum pallidi*, ubique dense papillosi; endostomii membrana sat alta, luteo-fusca, papillosa; *processus breves*, *lanceolati*, *vix fissi*; cilia *bina*, *tenella*, *omnino exappendiculata*. Spori minuti.

Hab. Sandy peat on open ground near lake, N. E., *c. fr.* (106). Axillary brood-branchlets are frequently numerous.

Nearly allied to *B. Montagneanum*, but distinct in the more longly aristate leaves—the arista in the uppermost leaves strikingly hyaline-tipped—and the much more highly developed inner peristome. The endostome of *B. Montagneanum* is described by C. Müller as "membrana interna lutea in cilia obsoleta vel irregularia divisa," and the species placed in the § *Peristomium Brachymenii*;

Paris places it under *Brachymenium*, under which genus Montagne first described it. It is no doubt on the border-line between the two genera, and the leaf-structure is very much like that of many *Brachymenia*. The present species tends, however, to relate it still more closely to *Bryum*.

B. rugosum C. M. differs equally with *B. Montagneanum* in the peristome, and has a differently formed, wider, ovoid capsule, as well as a much stouter purple red nerve, and more rigidly pointed leaves.

C. Müller writes of *B. Montagneanum*, "*Br. alpino* maxime simile," but the leaf-structure is in no way like that, nor are the fruiting characters. The capsule in the Kew specimen (Neilgherries, herb. Mont.) is shorter and wider and with a shorter neck than in the Ceylon plant, and also than the description of C. Müller would lead one to expect; it is probable that the species shows some variation in these respects.

B. ramosum (Hook.) Mitt. Mossy rock, Ped. (280).

B. Wightii Mitt. N. E.; rocks and stream by waterfall (79), an elongate, blackish plant with smaller leaves, which appears to be an aquatic form of this species; grass of floor of open jungle (104, 105); the latter a rather robust, dense-leaved form, somewhat like *B. Bolmhofii* in habit, though not in leaf; wet rocks near waterfall, *c. fr.* (272); near waterfall (283); Ped., dry rock in open place (284).

B. Bohnhofii C. M. Wet rock by waterfall, N. E. (235).

Rhodobryum roseum (Weis) Limpr. Decayed wood in jungle, N. E. (107).

Mniaceæ.

Mnium rostratum Schrad. Rock in jungle, N. E., *c. fr.* (109, 286); shaded rock under Ped., *c. fr.* (341).

Rhizogoniaceæ.

Rhizogonium spiniforme (L.) Bruch. Shaded rock by waterfall, N. E., *c. fr.* (108); tree over stream, Rombodde Pass, *c. fr.* (285).

Bartramiaceæ.

Philonotis imbricatula Mitt. Kandy (4); sandy and stony banks, N. E. (113, 116, 119, 120, 288); Udapassellawa (403); all *c. fr.*

P. secunda Doz. & Molk. N. E., wet roadside bank, &c., *c. fr.* (290, 291, 296).

Var. *Penzigii* Fleisch. Nanuoya, by stream (421*a*); near waterfall, N. E., *c. fr.* (426).

P. Turneriana (Schwaeg.) Mitt. Sandy margin of stream, N. E. (115).

P. nitida (Wils.) Mitt. nov. var. RIGIDIOR Dixon. A forma typica differt foliis *rigidioribus*, siccitate perstrictis, *melius seriatis*, marginibus *magis revolutis*; costa in aristam *longiorem*, *tenuiorem*, minus dentatam, *flexuosam* excurrens.

Hab. N. E. (294).

I think there is no doubt this is Mitten's species, although the type (Hook. & Thoms. 561, Simla, coll. Thomson) has the leaves a little less regularly arranged and more flexuose, the margins only very little recurved, the excurrent nerve shorter, more rigid and more toothed.

Fleischer reduces *P. nitida* to *P. Turneriana*, to which it is no doubt nearly allied; but the very glossy leaves, not appressed, but rigidly divergent when dry, seem to warrant its being kept apart. In all the specimens I have seen of *P. Turneriana* the leaves are quite without gloss when dry, and are almost always closely appressed.

? *Philonotis mollis* (Doz. & Molk.) Bry. Jav. A plant from Kandy (10) may perhaps belong here, but is doubtful.

Weberaceæ.

Webera fasciculata (Mitt.) C. M. Rock in stream under Ped. (356*a*).

Polytrichaceæ.

? *Catharinea Henryi* Salm. Below waterfall, N. E. (264). A sterile plant, in everything but the taller stems, up to 3 cm. high, agreeing with *C. Henryi* Salm., in which the (fertile) stems are rarely if ever more than 1 cm. tall. This, however, in the absence of fruit, together with the fact that *C. Henryi* is only known from Yunnan, causes me to hesitate to refer it to that species unreservedly. *C. pallida* (Ren. & Card.) differs in the leaves much more spinose at back of lamina (here they are very sparsely and shortly spinulose). *C. flaviseta* (Mitt.)—which appears to me to be a dioicous species—and *C. obtusula* C. M. have leaves more obtuse, more undulate, and the border and teeth weaker. Here, as in *C. Henryi*, the border of the leaf is deep red, and very clearly defined, in *C. flaviseta* the border and teeth are pale, and less clearly differentiated.

Pogonatum aloides (Hedw.) Palis. Common about N. E., *c. fr.* (123, 298).

P. Neesii (C. M.) Mitt. Syn. *P. hexagonum* Mitt.

Hollow of bank by road, N. E., *c. fr.* (295). I have sought in vain for any distinction between Mitten's *P. hexagonum* and *P. Neesii*; the description does not suggest any difference, nor does Mitten compare the two. I think there can be no doubt of their identity.

P. Teysmannianum Doz. & Molk. "Abundant about N. E. and on Ped., *c. fr.* (124); Udapassellawa, *c. fr.* (406, 407)." In these latter specimens the leaves are more abruptly expanded at the base than usual, but I cannot find any other difference.

P. microstomum (R. Br.) Brid. N. E., *c. fr.* (287).

(To be concluded.)

TWO NEW HYMENOSTEPHIUMS.

By S. F. Blake, A.M.

Hymenostephium pilosulum, n. sp. Herba ramosa 1·6–2·6 m. alta. Caulis tenuis striatulus viridescens vel purpurascens patenti-pilosulo-hispidulus pilis basi vix tuberculatis ætate subglabratus. Folia opposita vel superiora alterna ovata breviter acuminata basi cordata vel superiora truncato-rotundata serrata (dentibus patentibus vel appressis ca. 10–15-jugis mucronatis interdum basi 1-dentatis) trinervia tenuia supra viridia subdense piloso-strigosa pilis demum deciduis basi granulari-tuberculatis et glanduloso-adspersa, subtus dense subcanescenter pilosula pilis patentibus vel subappressis basi vix tuberculatis 4–5·5 cm. longa 2·8–5 cm. lata, superiora minora. Petioli patenter vel subappresse hispiduli immarginati 6–13 mm. longi. Capitula numerosa in apicibus ramorum in paniculis cymosis 3- 8-cephalis disposita 1·2–1·6 cm. lata, in pedicellis patenti-hispidulo-pilosulis vel dense canescenter strigillosis 3–15 mm. longis. Discus 6–7 mm. altus 7–11 mm. crassus. Involucri 2-seriati gradati 3–5 mm. alti squamæ oblongæ acutæ mucronatæ strigillosæ striatæ 1–1·5 mm. latæ. Radii ca. 8 neutrales flavi orbiculares ad ovales 3–7·5 mm. longi 2·8–3 mm. lati. Corollæ disci flavæ puberulæ 3·5 mm. longæ (tubo 0·8 mm.). Paleæ abrupte acutæ apice strigillosæ 4 mm. longæ. Achenia nigra basi crustaceo-marginata paululum incrassata subsparse appresse rufescenter pilosa 1·5 mm. longa 0·8 mm. lata. Squamellæ pappi ca. 6 oblongæ parum inæquales profundissime fimbriato-laceratæ ad 1 mm. longæ.

Oaxaca: Monte Alban, near Oaxaca, alt. 1769 m., Sept. 3rd, 1894, *Pringle* 4859 (type, hb. Kew). Costa Rica: Rio Torrés, Prov. San José, alt. 1006 m., March, 1894, *J. D. Smith* 4871 (hb. Kew). Distributed as *Gymnolomia patens* and *G. subflexuosa*. The Costa Rican plant differs to some extent in pubescence, and may prove distinct.

Hymenostephium cordatum, n. comb. *Wedelia cordata* Hook. & Arn.! Bot. Beech. Voy. 435 (1841); *Wedelia subflexuosa* Hook. & Arn.! l.c.; *Gymnolomia subflexuosa* (Hook. & Arn.) B. & H. fil. ex Hemsl. Biol. Centr. Am. Bot. ii. 163 (1881); Rob. & Greenm. Proc. Bost. Soc. Nat. Hist. xxix. 95 (1899). The types of both the species described by Hooker and Arnott were collected at Realejo, Nicaragua, by *Sinclair* (hb. Kew). In combining them I have adopted the specific name of the one having priority of position, although it is not especially applicable. Other specimens have been seen from Nicaragua: abundant on open ground, Chinandega, Jan. 12th, 1903, *C. F. Baker* 2018 (hb. Kew). Guatemala: Casillas, Dept. Santa Rosa, alt. 1220 m., Dec. 1892, *Heyde & Lux* 4212 (hb. Kew).

A recent attempt on the part of the writer to revise the small genus *Hymenostephium* has shown that the present plant, doubtfully referred to *Gymnolomia* by Robinson & Greenman in their revision of the latter genus, must be placed in *Hymenostephium*, if

the genera are to be kept distinct. As already remarked by Robinson & Greenman, there seems to be no morphological difference of the slightest significance between this species and *Gymnolomia microcephala* Less. (*G. patens* Gray), excepting the presence of a pappus in this plant and its absence in the other, a character which, as in many of the *Helianthoideæ*, is concomitant with the presence or absence of pubescence on the achene. Nor is this the only species technically referable to some other genus which so closely mimics a true member of the genus *Gymnolomia* as to suggest a doubt as to the real value in nature of the technical characters conveniently taken as diagnostic of the latter genus. There are several Viguieras whose similarity to species of *Gymnolomia* is so great that the only satisfactory characters for differentiation are to be found in the fruit, and at least one other *Hymenostephium* (*H. mexicanum* Benth.) is almost as close to *G. microcephala* as is the species under discussion. The cases of this "mimicry" are too numerous and too various in degree to find explanation in the fact, well known in this group, of the occurrence of epappose achenes in normally pappiferous species, and some other explanation of these convergences must be sought. It is a problem that should engage the attention of collectors in the region where these plants occur.

THE HERBARIUM OF JOHN LIGHTFOOT.

By James Britten, F.L.S.

The information given as to this in Journ. Bot. 1905, 291 may be supplemented in one or two points. In adding these, it will be needful to repeat in part what was said ten years ago, but reference must also be made to the 1905 remarks, as it is unnecessary to cite more than is needful to make the present note clear. After Lightfoot's death (1788) the herbarium was purchased for £100 by George III. and presented to Queen Charlotte. It was kept at Frogmore, where it was consulted by Goodenough, in 1791, when preparing his paper on British Carices (see Trans. Linn. Soc. ii. 141); at this time it was in a very bad state, and at Goodenough's suggestion, Smith was employed to preserve "what remained" (Smith Corresp. i. 290).

In Rees's Cyclop. s.v. Lightfoot, Smith describes it as "an excellent British herbarium, consisting of abundant specimens, generally gathered wild, and in many cases important for the illustration of his work: he had also amassed, from Sir Joseph Banks and other friends, a number of exotic plants." It contained the plants of Thomas Yalden (fl. 1750–74) who bequeathed his collection to Lightfoot; the figure of *Salicornia fruticosa* of Eng. Bot. t. 2467 (not the true plant) is drawn from one of Yalden's specimens, "now in Her Majesty's possession, permission having been graciously given to Mr. Sowerby for the purpose." James Sowerby's letter to the Queen, acknowledg-

ing this permission, is in the collection of autographs in the Department of Botany.

At Queen Charlotte's death the herbarium found its way to Christie's. I am indebted to Mr. W. Roberts for a transcription of the entry describing it which appeared in the catalogue of Christie's sale on June 2, 1821: Mr. Roberts tells me that a certain mystery attended the sale, as the collection "belonged to some one named 'Queen,' or some such name, but it must not be mentioned." The entry runs :—

"Lot 45. Rare and valuable Botanical Collection. The extensive Herbal of that scientific Botanist, Lightfoot, author of the Flora Scotica, comprising not only his collection for that esteemed work, but also the Plants procured by him from Italy; the whole of which are admirably preserved, and are accompanied by the scientific description of each plant by Mr. Lightfoot. They are contained in 24 cabinets of fine mahogany, the doors of beautiful wood, and the interior of each is fitted up with square trays or slides, exceedingly well contrived for preserving the several specimens."

The herbarium was bought at the sale by Robert Brown, whose name appears as purchaser (for fifty guineas) in Christie's catalogue. It seems to have remained in Brown's possession as a separate collection as lately as 1855, in which year it is referred to by Sir William Hooker (Hook. Journ. Bot. vii. 341) as "the herbarium of Mr. Lightfoot, formerly in the possession of Queen Charlotte, now in that of Mr. Brown, who has shown me, in that herbarium," specimens of *Athyrium fontanum*.

On the death of Brown in 1858, his private collections were bequeathed to John Joseph Bennett, who, with the permission of the Trustees, kept them in a room in the basement of the British Museum at Bloomsbury, where they remained until Bennett's death in 1876, when they became the property of the Trustees. Brown's Australian collections were then incorporated with the National Herbarium, the duplicates being distributed to Kew and Edinburgh (see Journ. Bot. 1876, 192); the rest of his herbarium was similarly incorporated, and in this were many specimens from Lightfoot, including the examples of *Athyrium fontanum* from Amersham, to which Hooker referred in the passage above noted. But, having been engaged in going through Brown's collections, I am in a position to state that nothing in the way of a separate collection of Lightfoot's plants then existed among them, nor were the specimens from Lightfoot so numerous as to suggest that his herbarium as a whole had been incorporated: neither was there any set of mahogany cabinets such as that indicated in Christie's catalogue.

Mr. Boulger's statement (Journ. Bot. 1883, 164) that Lightfoot's herbarium was included in that of G. S. Gibson at Saffron Walden was said (*op. cit.* 1905, 291) to be without foundation; many of his plants are however to be found there, where they have been seen by the Rev. H. J. Riddelsdell. The inaccurate assertion in the *Biographical Index* that the herbarium was at Kew gained

fresh currency from a note by Mr. Williams (Prodr. Fl. Brit. 393 (1910)) that he had seen a specimen of *Leonurus Cardiaca* from Monmouthshire "in Lightfoot's herbarium (now at Kew)." As has already been stated (Journ. Bot. 1910, 238) there is no such specimen at Kew, nor are the authorities there aware that they possess any of Lightfoot's plants. It would seem therefore that Brown must have parted with Lightfoot's herbarium between 1855 and 1858, and that the plants contained therein were distributed; our last knowledge of it as an entity is the reference cited from Sir William Hooker.

Whether Queen Charlotte had any collection other than that of Lightfoot is uncertain: a specimen of *Hydrangea radiata* Walt. in the National Herbarium from Brown's collections, labelled by him "Carolina, Fraser, from Queen's Herb." suggests that such may have been the case. The Queen was a patron of a scheme for manufacturing hats and bonnets from palm leaves which Fraser unsucessfully sought to establish (see Comp. Bot. Mag. ii. 303), and he may have presented her with some of the plants he collected. It would however appear that the "tribute of respect to her botanical zeal and knowledge" which induced Banks and Aiton to name in her honour the genus *Strelitzia* (see Smith in Rees) was not entirely an empty compliment—"few personages of so elevated a rank have ever loved the study of Nature more, or cultivated it so deeply." In his notice of Lightfoot Smith speaks of "his frequent invitation as a visitor to Frogmore, and to a regular course of conversations, rather than lectures, on botany and zoology, which her majesty and the princesses Augusta and Elizabeth honoured with their diligent attention; the queen regularly taking notes of every lecture, which she read over at its conclusion, to prevent mistake." Abbot dedicated to her by permission his *Flora Bedfordiensis* (1798): his "epistle dedicatory" concludes: "To the august Patroness of the *Hortus Kewensis*, whose scientific researches have justly obtained for her the character of the first female Botanist in the wide circle of the British Dominions, ... this Volume, chiefly designed for the amusement and instruction of that sex which boasts your majesty as its most distinguished Ornament, is humbly dedicated."

A NEW *VACCINIUM* FROM COSTA RICA.

By S. F. Blake, A.M.

Vaccinium (§ Disterigma) **dissimile**. Fruticulus repens subsimpliciter ramosus ramis adscendentibus ca. 6–10 cm. altis. Caulis ramique brunnei subteretes breviter hirtelli. Folia ovalia vel late elliptica interdum suborbicularia integerrima acuta vel obtusiuscula submucronata basi rotundata margine subrevoluta supra pallide virescentia puncticulata glaberrima indistincte sub-3–5 impresso-nervia subtus brunnescenti-tincta omnino avenia glabra 1·5–2·7 cm. longa 0·9–1·7 cm. lata, in petiolis hirtellis im-

marginatis 1–1·5 mm. longis. Flores pauci in axillis foliorum solitarii brevissime pedicellati; pedicelli ad 1·5 mm. longi puberuli apice bracteolis 2 ovatis obtusis hirtellis 1 mm. longis præditi. Calyx (anthesi) 4-dentatus appresse pilosulus 3·5 mm. longus (dentibus deltoideis appresse pilosulis et ciliatis 1 mm. longis). Corolla rubescens cylindrico-urceolata 4-dentata extus sparse appresse rufescenter glanduloso-hispida 9 mm. longa ca. 4 mm. dimetente. Ovarium 4-loculare. Stamina 8, ad 6·3 mm. longa; filamenta purpurascentia oblonga medio sparse pilosa; loculi antherarum 1·7 mm. longi exaristati; tubi 2·5 mm. longi. Fructus deest.

Costa Rica: alt. 1550 m., La Palma, Prov. San José, August, 1898, *Tonduz* ("12546 herb. nat. Cost.": distr. *J. D. Smith*, 7380) (hb. Brit. Mus., hb. Kew).

Distributed as *V. pachyphyllum* Hemsl., Biol. Centr. Am. Bot. ii. 275 (1881), which is very distinct in its much smaller (ca. 9×5 mm.) oval obtuse leaves, smaller sessile flowers, glabrous calyx (only the teeth ciliate toward apex), and densely shortly rufous-pilose branchlets. *Tonduz* 12453, from Costa Rica, distributed by J. Donnell Smith under the number 7464 as *V. alaternoides* Hook., is identical with *Endres* 154, type of *V. pachyphyllum* Hemsl.

NOTES FROM THE NATIONAL HERBARIUM.—III.*

By James Britten, F.L.S.

Centaurea rigida Banks & Sol.

"*Centaurea rigida*; calycibus simplicissimis spinosis: spinis erectis, foliis scabris: inferioribus pinnatifidis; superioribus lanceolatis integris, ramis paniculatis," Russell, *Aleppo*, ii. 263. Good specimens collected near Aleppo by Russell leave no doubt that this is identical with *C. myriocephala* Schultz Bip., although the sheets—there are two—now bear no name (I think it was erased when the plant was written up as *C. myriocephala*). The description of the plant cited above seems to have been overlooked; in DC. Prodr. vi. 604, only the name is cited (as "Russ. ex Steud. nom. phan. 175") which is placed among "Centaureæ vix notæ"; Boissier, who does not seem to have seen Russell's book, ignores the name. In the Index to the *Prodromus* (pt. 2, vi.) Buek names the plant *C. Russeliana*, having noted that *C. rigida* had been retained for the plant so named by Willdenow. *C. Russeliana*, by the way, finds no place in the *Index Kewensis*, wherein little account is taken of Buek's names published in his Index.

Willdenow's *C. rigida* (Enum. Pl. Hort. Berol. Suppl. 61) is an obscure plant; it is thus described:—"C. calycibus ciliato-subspinosis, foliis cblongis tomentosis sessilibus subdentatis basi

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* For preceding notes, see Journ. Bot. 1907, 313; 1909, 41.

angustatis profunde dentatis." With this the *Prodromus* unites another plant, of which the native country is equally unknown—*C. rigescens* Hornemann (Hort. Hafn. 852) described as "calycib. conicis, flosculis radii longissimis, fol. radicalibus petiolatis ovali-lanceolatis, caulinis sessilibus ovalibus grosse serratis rigidis." The synonymy of the two species is as follows :—

CENTAUREA RIGIDA Banks & Sol. in Russell, Aleppo, ii. 263 (1794); "Russ." ex Steud. Nomencl. 175 (1821).
C. Russelii Buek, Index ad Prodr. pars ii. p. vi (1840).
C. myriocephala Sch. Bip. ex Boiss. Fl. Or. iii. 682 (1875).
CENTAUREA RIGESCENS Hornem. Hort. Hafn. 852 (1815).
C. rigida Willd. Enum. Pl. Hort. Berol. Suppl. 61 (1813), non Banks & Sol.

CROCUS SATIVUS β. VERNUS L. (Banks & Sol.).

Russell's specimens of this have been seen and reported upon by more than one botanist. Gawler (Bot. Mag. t. 1384) refers it to his *C. sulphureus*, but Herbert (in a note on the sheet, which he subsequently embodied in his paper in Journ. Hort. Soc. ii. (1847)) says it is not that species, and (*l. c.* 283) places it under *C. lagenæflorus* Salisb. His note upon it seems worth transcribing; the doubt which he casts upon the authenticity of the specimen has no foundation, and one of the two plants which he combines under the phrase "the remnant of a specimen" certainly affords material for determination. Writing of certain varieties of *C. lagenæflorus*, he says:—"There is in the Banksian Herbarium a remnant of a specimen said to have been gathered near Aleppo by Russell, which has a streaked flower much like that of *stellaris*, and belongs, according to the bulb-coats, to *lagenæflori*; but I cannot hear that such a plant is to be found near Aleppo, or anywhere except in gardens; and there may be some error as to the specimen." Mr. George Maw, when preparing his Monograph on *Crocus*, labelled Russell's specimen "probably only the striped form of *vitellinus*" Wahl. (*syriacus* Boiss. & Gaill.).

CRUSEA HISPIDA.

This is the correct name for the plant usually known as *C. rubra* Bartl., as appears from the synonymy quoted by him in *Linnæa*, xiv. litt. 125. It is the *Spermacoce strigosa* of Herb. Banks and the *Crucianella hispida* of Philip Miller, both names being cited by Sims (Bot. Mag. t. 1558), who adopts the former name for the species. The figure is said to have been made from specimens raised at Fraser's nursery from seeds brought by him from Cuba, but the plant does not appear to be West Indian. The descriptive phrase cited by Sims from Houstoun's MSS. was sent to Miller by Houstoun with his specimen from Vera Cruz, to which Miller (who cites it in his *Dictionary*) attached it in his herbarium, adding the word "hirsutis"; this is the specimen referred to by Sims.

The synonymy is:—

CRUSEA HISPIDA comb. nov.

Crucianella hispida Mill. Dict. ed. 8, no. 4 (1768)!
Spermacoce rubra Jacq. Hort. Schoenbr. iii. 3, t. 256 (1798).
S. strigosa Herb. Banks! ex Sims, Bot. Mag. t. 1558 (1813).
Crusea rubra Bartl. in Linnæa, xiv. litt. 125 (1840).

MACROCALYX Miers.

This is one of the genera of which the name alone has been published, and which can only be identified by reference to the author's specimens. It stands in *Index Kewensis* as "*Macrocalyx* Miers ex Lindl. Veg. Kingd. 764 (1847) Rubiaceæ (Quid?)" and no further information has appeared concerning it. While incorporating the Miers collection with the National Herbarium I came across Miers's specimens of the plant and found in his MSS. a drawing and notes; these Mr. Spencer Moore was able to identify with *Faramea calyciflora* A. Rich. Miers identified his plant with *Sutera macrocalyx* Mart., which he considered synonymous with *Psychotria fluminensis* Vell., but Müller (Fl. Bras. vi. 5, 267–8) retains these as distinct species of *Psychotria*—the former as *P. melanocalyx* Muell. Arg.

RUELLIA LONGIFLORA Vahl.

In his *Symbolæ Botanicæ* (i. 45, t. xv. (1790)) Vahl figures and describes as a *Ruellia* a plant which "errore editoris" had been placed by Forskål (Fl. Ægypt. Arab. cxvii. 126, 1775) under *Camellia*. It is clear from Forskål's full description that he could not have meant to place the plant in the class Icosandria, where it stands in his book, and his full description accords well with *Ruellia*; but on the other hand several species of *Ruellia* occur together elsewhere (cxv. 111). The specific name given by Forskål was *grandiflora*, but this is quoted by Vahl and authors generally—the *Index Kewensis* omits it—as *longiflora*. Whether Forskål himself altered the name in his MSS., to which Vahl had access, is uncertain; the view is supported by the fact that his specimen in Herb. Banks was written up by Banks "Ruellia longiflora Forsk." If the correction of *Camellia* to *Ruellia* be accepted, Forskål's published trivial will have to be retained, as it antedates *R. grandiflora* of Poiret (Encycl. Meth. vi. 340, 1804), but under the circumstances I refrain from making the new combination. The Banksian specimen of the plant, which does not seem to have been met with by recent collectors, corresponds admirably with Vahl's figure.

XERANTHEMUM ORIENTALE Banks & Sol.

"*Xeranthemum orientale*; herbaceum, foliis lanceolato-oblongis, calycibus inermibus, semineum paleis denis. *Xeranthemum annuum* γ. *orientale* Linn. Sp. Pl. 1201," Russ. Aleppo, ii. 263.

This is *Chardinia xeranthemoides* Desf., but the specific name will have to be changed in accordance with the Vienna Rules. The synonymy is as follows:—

CHARDINIA ORIENTALIS.

Xeranthemum orientale Mill. Gard. Dict. ed. 8, n. 3 (1768); Banks & Sol. in Russ. Aleppo, ii. 263 (1794); Willd. Sp. Plant. iii. 1902 (1800).

Chardinia xeranthemoides Desf. in Mém. Mus. Par. iii. 455 (1817).

Russell's specimen was communicated to Banks "ex Herb. Dni Hope, Bot. Prof. Edinb."

FREDERICK MANSON BAILEY.
(1827–1915)

Frederick Manson Bailey, the *doyen* of Australian botanists, died at his residence, Kangaroo Point, Brisbane, on June 25th; he was born at Hackney, not then as it is now a part of London, on March 8th, 1827. His father, John Bailey, who was in business as a nurseryman and seedsman and was well acquainted with plants, sailed with his family to Australia in 1838, and arrived in Holdfast Bay, South Australia, in March, 1839: he was at once appointed Colonial Botanist, and laid out the first botanical garden in Adelaide. He, however, resigned this position and resumed his occupation as a nurseryman. "Bailey's gardens" became well known, and Frederick took part in its management. He afterwards took part in the Victorian gold-rush, and subsequently went to New Zealand; he ultimately settled in Brisbane in 1861, in the seed business, but this failed and for a time no career seemed open to him. During this period, however, he must have devoted much attention to botany, as his *Handbook to the Ferns of Queensland* was published in 1874.

"In 1875 a Board was appointed by the Queensland Government to inquire into the causes of diseases affecting live stock and plants, and Mr. Bailey was appointed to deal with the botanical side of the problem. He took up the work with the enthusiasm and thoroughness typical of his nature, and pursuing his investigations far and wide throughout the State he contributed some valuable articles in regard to the native grasses of Queensland. He next was appointed to the charge of the botanical section of the Queensland Museum, and in 1881 was appointed to the proud position of Colonial Botanist of Queensland—a position he held and the duties of which he discharged with devotion and with benefit to the State up to the time of his death. During the years that followed his appointment as Colonial Botanist he travelled extensively throughout the State, and gained much valuable information regarding the flora of Queensland and its timber resources.

"In reviewing a life so full of activity and so useful it may be pointed out that, while paying attention to the systematic description of plants and their nomenclature, he laid very great stress on their economic uses, and during the term of his official career he

demonstrated the great value of native grasses, and emphasised the value of the timber resources of the State. He was a trained horticulturist, and his advice as a practical gardener, as well as a scientist, was always eagerly sought. He wrote interestingly regarding the garden plants and naturalised weeds. Another feature of his work was that he always kept his knowledge of the plant life of Queensland up to date. At one time he was indefatigable in travel in order to prosecute his research work, and in comparatively recent years he undertook a Northern tour and ascended the Bellenden Ker range. In the official report dealing with the expedition he gave a full account of the plants of that region. He also studied plant life closely in the aspect of its medicinal value, and investigated the uses made of plants by the aborigines as food and for other purposes. As a scientific botanist he ranked high, and his information was always sought by botanists, Australian or foreign. He was not only in constant communication with the workers in this science, but prided himself on being a disciple of them—especially of the late George Bentham, the author of the great work on Australian plants, *Flora Australiensis*. Among his friends he numbered also Baron F. von Mueller, late Government Botanist of Victoria. As a worker he was tireless, and for years, after his official hours, was to be found at his desk in his own home pursuing the study of Australian plants. An illustration of his absorption in his work is found when, in the nineties, a period of retrenchment was ushered in, and Mr. Bailey's position as Colonial Botanist was abolished. Despite that fact he continued to attend his office and discharge his duties cheerfully, stating that the work must proceed whether he was paid for it or not; and there was such a protest from the public, who recognised the valuable work he was doing, that he was soon reinstated in his position with honour."

Bailey's contributions to systematic botany were varied and numerous. The most important of these was *The Queensland Flora*, issued by the Queensland Government in six parts (1899–1905); this had been preceded by a *Synopsis of the Queensland Flora* (1883), to which three supplements were added. Although from a literary standpoint the work is open to criticism, it is an exceedingly valuable book, rendered more useful by the introduction of illustrations. Illustrations form the important feature of Bailey's latest work, a *Comprehensive Catalogue of Queensland Plants* (not dated, but issued in 1913); this, as its name denotes, is a mere catalogue, its chief purpose being to provide the local botanist with representations of the flora. In addition to these, "contributions" to the Flora were published in periodicals over a long series of years. In 1906 he published a (very poorly) illustrated volume on *The Weeds and Suspected Poisonous Plants of Queensland* (1906); other economic papers were issued in connection with the International Exhibition at Melbourne in 1888. *A Companion for the Queensland Student of Plant Life*, which went through two editions (1893, 1897), is a useful popular

introduction to botany, with a full glossary, prepared for the Brisbane Department of Agriculture, by whom it was gratuitously distributed.

Bailey became a Fellow of the Linnean Society in 1878; in 1911 he was created C. M. G. by letters patent. We are indebted to his son, Mr. John F. Bailey, Director of the Brisbane Botanic Gardens, for a copy of the *Brisbane Courier* of June 26th, from which much of the above information is taken.

BIBLIOGRAPHICAL NOTES.—LXI.

Persoon's "Observationes Mycologicæ."

Much confusion seems to exist in connection with C. H. Persoon's *Observationes Mycologicæ*, brought about by the fact that the title was used for two quite distinct publications. The first of these appeared in Usteri's *Annalen der Botanik*, xv. pp. 1–39 (1795), with three plates. The next year the first part of a separate work, *Observationes mycologicæ, seu descriptiones tam novorum quam notabilium fungorum*, was published, containing one hundred and sixteen pages and six coloured plates: the second part was issued in 1799, and has one hundred and seven pages, with six coloured plates. The first thirty pages of the first volume of the independent work are very similar to the article in Usteri, but in spite of an apparently fairly common assumption they are not identical. This assumption is probably due to the fact that, owing to omissions and additions, the index numbers of the species agree in the vast majority of cases.

The differences in the two works are as follows. There is no dedication to the 1795 paper, but to the first volume of the independent work is a short dedication to S. J. Brugmans (the second volume is dedicated to J. E. Smith). The introductions are different, the main difference being the addition of one paragraph and the omission of two. The botanical descriptions and observations are also often slightly different.

No. 7 *Physarum nutans* of the 1795 paper is replaced by *P. muscicola* in the independent work; 12 *Agaricus fastidiosus* by *A. æstivus*; and 20 *Isaria umbrina* by *Trichoderma læve*. In the later work *Poria rubella* is added, with the number 24, and thus 24 *Poria vitrea*, 25 *Corticium cæsium*, 26 *Corticium hydnoideum*, and 27 *Corticium alutaceum* of the former work become 25 to 28. By the omission of 28 *Corticium ? fœtidum* and 29 *Uredo candida*, 30 *Uredo mycophila*, and 31 *Uredo appendiculata* become 29 and 30. As there is no No. 31 in the separate work, the numbers run together again up to No. 71. The remaining four numbers of the earlier work are quite different from the work of the following year, *e. g.* No. 74 *Diderma vernicosum* becomes No. 151.

There was apparently no further publication of *Observationes* in Usteri's *Annalen*. (The reference given to a second part, *e. g.* in Lindau & Sydow's *Thesaurus* to "16. Stück, 1795, pp. 1-33," is

incorrect.) In vol. xx. p. 115, 1796, there is a notice of the separate publication by Persoon himself, giving most of the differences between the two publications. There is also an account of the new species and the three extra plates are reprinted but uncoloured. It is probably this sixteen-page notice that has led some writers astray.

In the copy of Usteri's *Annalen* in the National Herbarium there is a note by Mr. W. Carruthers mentioning most of the changes in the independent work, which was apparently not then in the Museum library, as Berkeley's copy of the work was obtained only in 1904. In the cover of the latter is a letter from Persoon to Sowerby, and as so little is known of Persoon, the half-bred Hottentot, who had an extraordinary influence on the systematic study of fungi, its publication may be of interest:—

"Dear Sir,

"By Dr. Bouttatz You shall have received already the packet sent to You least Easterday with great desire for Your kind answer to the questions I made so free to propose You in my letter the reply to them being of any interest to me.

"At present I enjoy the pleasure to send You the second part of my *Observat. Mycologicæ*. The first and second volume of my edition of Thunberg's Disertations I add too, believing to have not yet made over a sufficient equivalent for Your beatiful work on Fungusses. Long time ago I should also have sent to You my edition of the systema vegetabilium, but being not enabled, by shortness of time, to augment it considerably, I dont believe it should give You proper satisfaction, but expresly desiring, I shall get conveyed it over to You at next opportunity. In Your last letter You declared, Dear Friend, to not be averse for giving the rest of Your publications in exchange. Might I yet wish something to possess, 't would be Your compleat *english Botany* for an exemplar of the new edition of Schæffer's *Icones fungorum Bavariæ indigenorum with my commentary*. I wish to receive an answer towards this proposition in short time.

"In case You should not have written to me now by the quarter courier, pray be as kind as to forward letters to me through the common mail by Cuxhaven.

"Remaining with utmost estimation

"Your most obedient servant

"C. H. Persoon, Dr.

"Goettingen, the 19th June, 1800."

J. Ramsbottom.

[We have also in the Department of Botany an autograph letter to Robert Brown, dated Paris, 1 Mai, 1825, acknowledging the receipt of a presentation copy of his *Prodromus*, and the MS. of a paper, apparently unpublished:—"Veronicæ agrestis, arvensis, segetalis, et acinifolia, descriptæ et iconibus illustratæ a C. H. Persoon": a drawing of *V. agrestis* accompanies this. There are full descriptions of the four species: *V. segetalis*, published by

Persoon in Usteri's Ann. Bot. xiv. 38 (1795), is not retained in his *Synopsis* (1805); in *Index Kewensis* it is united with *V. præcox* All., from which and from *V. ocymifolia* Persoon in his MS. carefully distinguished it.—Ed. Journ. Bot.]

SHORT NOTES.

Polygala dunensis (p. 250).—Mr. Wheldon's note called to my mind Mr. E. G. Baker's interesting report (Journ. Bot. 1896, p. 399) upon Mr. T. Hilton's Sussex "*P. ciliata*," which Prof. Chodat had examined and considered agreed "in all parts" with *P. dunensis* Dum. This is, perhaps, the first mention of this plant as an inhabitant of Britain.

A few years ago Prof. Corbière examined some sheets of *Polygala* I sent him, and he identified the following:—

P. dunensis Dum. Sussex, E.; Downs between Hodshrove and Bevendean, 1900, *T. Hilton.* Sussex, W.; Graffham Down, 1901, *C. E. S.* Durham; Blea Gill, Teesdale, 1898, *H. T. Mennell.*

Var. *ciliata* (Lebel) Corb. Sussex, E.; Downs, Jevington, 1900, *T. Hilton.* Near Brighton, 1904, *C. E. S.* Sussex, W.; Barlavington and Graffham Downs, 1901, *C. E. S.*

P. dubia Bellynck. Sussex, E.; Petley Wood, near Battle, 1894, *E. S. & C. E. S.* Sussex, W.; Heyshott Down, 1901, *C. E. S.* Kent, E.; roadside near Wye, 1900, *C. E. S.* Bucks.; below Ivinghoe Beacon, 1904, *C. E. S.* Glamorgan, limestone coast, Porthcawl to Sker, 1901 (Ref. No. 2544), *E. S. Marshall.* Sutherland; the links, Dornoch, 1907, *R. S. Standen.*

Under *P. dunensis* may also go, without much doubt, a plant I gathered in 1909 in Norfolk, W., between Wells and Holkham.

I may add that the majority of specimens that Prof. Corbière determined as *P. dubia* had been "doing duty" as "*P. oxyptera* Rchb." in my herbarium, a plant which the Professor does not admit into his *Flora of Normandy*.—C. E. Salmon.

Gaultheria shallon Pursh.—Lieutenant A. S. Marsh sent me a flowering specimen of this ericaceous shrub, which he gathered on Leith Hill, Surrey, last midsummer. The plant was recorded from the same locality in this Journal for last year (p. 250). Mr. Marsh adds that the plant was growing on a sandy subsoil among heather, bilberry and bracken. There is, of course, no chance that the species (native in pine-woods in the north-west of North America) is indigenous in the British Islands; but its occurrence among such undoubtedly aboriginal plants as those above mentioned is worthy of record. I do not know if the plant produces ripe seeds in this country: if so, birds may be responsible for its introduction on Leith Hill, for it is not infrequently cultivated in England: if not, I suppose it must be virtually an outcast of a garden or have been intentionally introduced. The last hypothesis is tenable, for Lindley (Bot. Reg. t. 1411) expresses a "hope that this plant may one day become useful as a covert

for game." Lindley (*l. c.*) spells the generic name *Gautheria*: other variants are *Gualteria* (Scopoli), *Gualtheria* (J. F. Gmelin), *Gautiera* (Rafinesque), *Gaulthiera* (Reichenbach), *Gaulthieria* (Klotzch). Part of the orthographical difficulty turns on the name of the botanist whom the name commemorates. Was it Gaulthier or Gautier (*vide* Lindley *l. c.*)? If the former, then Reichenbach's spelling would seem to be in the most classical form; if the latter, then Rafinesque's would seem to deserve that mention. As to the trivial name, if it is (as appears to be the case) merely a native word, then the Vienna Rules would demand "*shallon*" and not "*Shallon.*"—C. E. Moss.

[With regard to the spelling of *Gaultheria*, there can be no doubt that this was the original form: it appears thus in *Nova Plantarum Genera* (Linn. Diss. 1751, p. 20) with the note, "Dixit plantam Cl. Kalmius a D. D. Gaulthier, Medico Canadensi, Botanico eximio." This also disposes of Lindley's doubt (*l. c.*) as to whether the plant was named "after one Gaulthier, the author of an Introduction to Botany, published in 1760, or [after] Gautier, a French writer upon Natural History, about the same period." In face of this doubt, it seems strange that Lindley should consider *Gautheria*—which represents neither of the names as he spells them (do they really represent different persons?)—"the proper orthography of the word." Nor do either represent the name of the man commemorated—a matter in which the founder of the genus was equally at fault—for that stands upon the title-page of his book (*Introduction à la connoissance des Plantes*, Avignon and Paris, 1760) as Gauthier.

In any case, it would appear undesirable to alter the accepted spelling of the name, for although this may be regarded as an "orthographic error" and is thus according to the Vienna Code, Art. 57, open to correction, the recommendation is appended to the Article that "the liberty of making orthographic corrections must be used with reserve, especially if the change affects the first syllable, and above all the first letter of a name." The judgement of the "orbis terrarum" has decided that *Cinchona*—the spelling of which was hotly contested some thirty years ago—is to be retained, although it commemorates the Comtesse de Chinchon; and it may be doubted whether the substitution of *Kentranthus* for *Centranthus* will meet with general acceptance, although there is no question as to its being the earlier, as well as the more correct, form. An example of a correction which causes no inconvenience is the substitution of *Teesdalea* for the generally accepted and original spelling *Teesdalia*—this in accordance with Art. 25, Recommendation IVa, and in analogy with *Sloanea*.—Ed. Journ. Bot.]

Agrimonia odorata.—The reference to *Agrimonia odorata* (Journ. Bot. 1915, p. 246) reminds me that in July I found this handsome plant in three different places in North Somerset—a new record for the county. First, with Mr. Ellman, in the neighbourhood of Charterhouse on Mendip. On revisiting the spot for more mature specimens, I came across a large quantity

in a hedge of a meadow nearer Blackdown. Some of the plants were six feet high, and formed a conspicuous object from a considerable distance. A plant or two were also noticed nearer Shipham. A week later I saw three clumps at the end of a long lane near Farrington Gurney. A damp meadow adjoining was bedecked with the common Agrimony, with its rosettes of short leaves when growing in the open; but there was no sign there of *odorata*, which prefers bushier places. *A. odorata* is a more distinct plant than I formerly thought; but the descriptions in several English floras are not so satisfactory as *e.g.* that in the *Flore de la Suisse* by Schinz & Keller, who point out that the resinous glands on the stems and leaves [and calyx] of *odorata* are often distinctly peduncled, and that occasionally *A. Eupatoria* has a few scattered but sessile glands of a similar character. After examination of many specimens I find this to be true. In Coste's *Flore de la France* there are excellent figures of both plants, but he omits the fact that occasionally minute yellowish glands are found on the leaves of the common species. To me the most constant distinguishing feature of *odorata* is the shallow rudimentary furrows of the matured calyx, which never extend the whole length as in *A. Eupatoria*.—H. S. Thompson.

Calamagrostis stricta var. Hookeri.—This interesting, and it would seem endemic, plant has been sent me from Nayland Hundred, West Norfolk, by Mr. Robinson. The specimens are even more extreme than the Irish ones, as the hairs at the base of the florets are in many flowers actually longer than the glumes, and the ligule of the uppermost leaf is three times as long as broad. Within three or four miles of this the species also occurs, but does not exactly match either the Cheshire, Caithness, or Irish plants, having the hairs at the base of the florets only half the length of the glumes.—Arthur Bennett.

Diotis maritima.—In Davey's *Flora of Cornwall* this is said to be extinct, but while botanizing at Par in August in company with Mr. E. Thurstan, after looking over the many good things found at the harbour, we went on to the sands to get *Euphorbia Paralias*, and were fortunate enough to come upon *Diotis* in full flower. It was last reported from Par Sands, near Penzance, in 1881 by Marquand, "a small flowerless specimen only two or three inches high." It is interesting to note its recurrence after so many years.—W. Wise.

The Colour of Mercurialis perennis.—Will some one kindly explain why dried male specimens turn such a curious dark green, and after some years a sort of purplish green; while female plants remain the natural green colour? I have three female examples of this plant, collected in 1825 by Thomas Clark in Somerset, which are as light green and natural in colour as one dried last May. The rhizome and part of the stem, however, is tinged with the indigo-green of dried male plants with which it has been in contact for three months.—H. S. Thompson.

Westmorland Mosses and Hepatics.—In a county so often visited on account of its many natural charms, amidst which ample scope is offered to the plant-lover, it is not surprising that careful attention should have been given to Mosses and Hepatics. A list of these, comprising 355 species of Mosses (excluding Sphagna) and 126 of Hepatics, was published in the *Naturalist*, 1886-98, by the late Mr. G. Stabler, of Levens; hardly less valuable is his prefatory account of the work of earlier bryologists in the county. Researches carried on through many years by such an acute and diligent worker left but little in the way of fresh county records to be added by succeeding bryologists; still a few interesting species have come to light in recent years in the county, and the present writers have pleasure in putting these on record. They are, amongst Mosses:—

Dicranella curvata Lindb.
Campylopus subulatus Schimp. } Grasmere and Langdale.
Grimmia elongata Kaulf. Langdale.
Glyphomitrium Daviesii Brid. Grasmere.
Campylostelium saxicola B. & S. Ambleside.
Leptodontium recurvifolium Lindb. Patterdale, Mr. H. N. Dixon.
Meesia trichoides Spr. Harter Fell, Mardale.
Webera Ludwigii Schimp. Langdale.
Bryum cyclophyllum B. & S.
B. erythrocarpum Schwaegr. } Grasmere.
B. capillare var. *elegans* Braithw. Near Grisedale Tarn.
Hypnum ochraceum var. *flaccidum* Milde. Easedale, Grasmere.

It may be noted that thirteen of the species included in Mr. Stabler's list are now recognised as merely varieties; so that deducting these and adding recent finds the county can at present claim 352 Mosses, excluding Sphagna.

The following Hepatics were collected in 1914:—

Plagiochila asplenioides var. *minor* f. *laxa*. Grasmere.
" " var. *major* Nees. Little Langdale.
Ptilidium ciliare var. *inundatum* Schiffn. Near Grisedale Tarn.
Cololejeunea microscopica (Taylor) Schiffn. Langdale.

Eleonora Armitage: C. H. Binstead.

REVIEWS.

The Mutation Factor in Evolution, with particular Reference to Œnothera. By R. Ruggles Gates, Ph.D., F.L.S. 8vo, pp. xiv. 353, 114 text-figs. Macmillan, 1915. Price 10*s*.

Dr. Gates has been working on the mutations shown by the species of the genus *Œnothera* for ten years, and during that period has studied the subject from many standpoints. His earlier investigations were carried out in America, the original home of the genus, but latterly he has enjoyed the hospitality of the John Innes Horticultural Institution and the Gilbert and Lawes experimental station at Rothamsted. He has published numerous papers on the mutations of *Œnothera*, but in the work now under

notice he has endeavoured to bring together all the facts which bear vitally upon the question of mutations, confining his attention mainly to *Œnothera*, because it is with reference to this group that most of the crucial questions concerning mutations have been debated and decided.

Dr. Gates's careful investigations—not only of the external morphological characters of the various species, varieties, and mutations, but also of their cytology—lend weight to his conclusions; and we think that many botanists who have received with impatience the dogmatic utterances and limited views which have in certain quarters been impressed upon them, will welcome the more philosophical treatment and broader view which he has adopted. Important among his conclusions is the statement that mutation is not merely a phenomenon of hybridism but a process *sui generis*, a conception which the author regards as amply justified; "every line of investigation of the *Œnothera* mutations," he says, "has strengthened this view, to the point of demonstration."

The book should interest every botanist who is anxious to keep in line with the trend of modern investigation, but it is of special interest to the systematist. The author has carefully studied the known species of the Onagra group of *Œnothera*, not only in the field or garden but also in the herbarium, and has been at some pains to determine the plants mentioned by the pre-Linnean botanists. On this historical portion of his work much light has been thrown by the study of the old collections at the British Museum and at Oxford. Dr. Gates recognizes twenty-eight species, and gives a useful map indicating their distribution in North America.

It is evident that the progress of civilization has materially affected the original distribution of the species. Not only have several of them become widely distributed and comfortably settled in the Old World, but others have become rare or entirely lost in their original habitat. It is only recently that *Œnothera Lamarckiana*, as to the origin of which so much has been written, has been discovered to have had a wild habitat. It is the common evening primrose of English gardens, and has been extensively naturalized on the Lancashire coast for more than a century, and is now known only naturalized and in cultivation. It has been supposed to have originated as a garden hybrid, but a specimen has been found at the Museum d'Histoire Naturelle in Paris, collected by Michaux about 1796, which agrees exactly with the *Œ. Lamarckiana* of modern cultivation. It is probable that the plant described by Lamarck in 1796 as *Œ. grandiflora* was grown from seed sent by Michaux from North America; Séringe recognized this species as different from the *grandiflora* of Solander, which had been introduced from Alabama, and changed the name to *Œ. Lamarckiana*. How the plant reached the Lancashire locality is unknown, but as early as 1805 it was plentiful there, and plate 1534 in Sowerby's *English Botany*, which Dr. Gates reproduces, probably represents this form.

Two long chapters (iv. and v.) are devoted to a description of the mutation phenomena in *Œ. Lamarckiana* and other species, and a full account is also given (chapter vi.) of the cytological basis of the mutation phenomena. Assuming that every mutation is the result of a change in the constitution of a particular cell or cells, one may expect this change to be, in the great majority of mutations, either ultramicroscopic or chemical in character. The only instances known in which a visible alteration in cell-structure has taken place are those which involve a change in the size of a cell as a whole or in the chromosomes of the nucleus. It is these nuclear changes which have been a special object of Dr. Gates's study, and to him we owe the demonstration of their important bearing on the study of mutations.

In his final chapter on the evolutionary significance of mutations the author severely criticizes the "loss of factor" view adopted by Professor Bateson, which he describes as embodying a conception of evolution as crude and elementary in its way as was the *emboîtement* theory of embryology developed by Bonnet in the eighteenth century.

Enough has been said to show that Dr. Gates's book is full of interest to the biologist or botanist, and it remains to add that there is an excellent bibliography, and that the volume is remarkably clearly printed and otherwise produced in the manner which we associate with Messrs. Macmillan's handbooks.

A. B. R.

The Ascomycetes of Ohio. — 1. Preliminary Consideration of Classification. By BRUCE FINK.—2. The Collemaceæ. By B. FINK and C. AUDREY RICHARDS. The Ohio State University Bulletin. Vol. xix. No. 28. Pp. 70. 6 plates. 50 cents.

THE first contribution begins, "All classifications of Ascomycetes hitherto followed have been highly artificial, nor are the data for a satisfactory distribution at hand." Further, "Had it not been for clinging to erroneous tradition, the researches referred to above and others like them would have convinced all botanists that the lichen is a fungus living in some peculiar relation with an alga." The researches mentioned are the well-known ones on growing lichens in pure culture, researches which *have* convinced botanists that there is some peculiar relation between alga and fungus, that of symbiosis. The author's idea, however, is that a lichen is a fungus which lives in parasitic relationship with an alga during all or part of its life, and also sustains a relationship with an external substratum, organic or inorganic. There is much talk about clear thinking, but the discussion seems in many places quite illogical. Lichens and fungi are classed together, as many have previously suggested, on the plea that lichens are a physiological class: but on this reasoning what becomes of the fungi? The writer quotes the well-known cases of transition forms between fungi and algæ, forms which are at least as easily explained on the so-called dual-hypothesis as on any other, if the lichens be considered of polyphyletic origin, as all evidence leads us to hold. The cases of

sexuality are then considered and much is made to depend upon the much abused "trichogyne." Would that some wit would suggest the polyphyletic origin of this all-important structure!

In any consideration of the origin of Ascomycetes it would seem logical, no matter what theory of sexuality be held, to consider the case of *Eremascus*, *Dipodascus* and other "primitive" Ascomycetes. The author seems to be "clinging to erroneous tradition" when he says, regarding these, that "The Hemiascales (Hemiascineæ) of some authors have not been admitted, though *Eremascus* and some others of these plants may yet prove to be Ascomycetes rather than Phycomycetes"—but the Saccharomycetales are included! It is admittedly impossible to arrange any class satisfactorily in a linear series, but the order adopted here is open to much criticism:—Laboulbeniales, Pezizales, Lecanorales, Caliciales, Helvellales, Tuberales, Phacidiales, Hypocreales, Dothidiales, Sphæriales, Pyrenulales, Perisporiales, Aspergillales, Exoascales and Saccharomycetales. As this is a "provisional arrangement which is to serve as a basis for the study of various groups of Ohio Ascomycetes," a detailed criticism would be here out of place: but if the study be as intensive as is evidently proposed, there is no doubt that the arrangement will be radically altered. A full bibliography and two plates are added.

After the recent writings of the senior author, one turns with interest to the treatment of such a group as the Collemaceæ, where the alga is the predominant partner in giving morphological characters. "In order to dispose of typical lichens as fungi, no greater departure from the ordinary methods is required than to omit from the description all reference to the algal host." When, however, we turn to the generic and specific descriptions, we find that they commence "Transforming the algal-host colony . . ." and then is described the shape of the whole structure! The net result is that an ordinary description is given, excepting for some slight changes in terminology. The introduction gives a general account of the group. In the systematic account the four North American genera are dealt with: *Synechoblastus*, *Collema* and *Leptogium*, each with five species, and *Mallotium* with one species. One species of *Synechoblastus* and one of *Leptogium* are described as new. The sexual organs, so interesting in this group, are dealt with separately at the end: it may be pointed out that there is, throughout both papers, an irritating misspelling of "spermogonia." There is a short bibliography and four plates.

J. RAMSBOTTOM.

BOOK-NOTES, NEWS, &c.

THE London Manx Society has reprinted from the *Isle of Man Weekly Times*, as a shilling pamphlet (to be obtained from Mr. J. B. Shimmin, Canterbury Road, Leyton, N.E.), an account of the proceedings at the Edward Forbes Centenary Commemoration, held at Burlington House on Feb. 15th. An interesting summary of Forbes's botanical work was given by Prof. Bottomley.

In connection with this attention may be called to Forbes's "Hortus Siccus Monensis," a small folio volume now preserved in the Department of Botany. A note by Sir Joseph Hooker states that this was transferred from the Geological Museum to Kew in 1856, from which latter place it was withdrawn in 1888. The specimens, which are small and arranged on the Linnean system, include the *Polygala* (apparently a form of *depressa*) which he described but did not name in a communication read before the Edinburgh Botanical Society, Dec. 8th, 1836 (printed in the First Annual Report of the Society, p. 42 (1841)). He was in the Isle of Man 1834–6 and sent Watson a list of Manx plants for *Topographical Botany*, but the little herbarium was probably made at an earlier period; he also furnished the sketch of the flora of the island which appears in J. G. Cumming's *Isle of Man*, pp. 360–64. Prof. Bottomley at the meeting referred to showed plants collected by Forbes, from the King's College Museum. A portrait accompanies the report.

At the meeting of the Linnean Society on June 17th, Dr. G. B. Longstaff exhibited some foxglove flowers from his garden at Putney. In 1913 he had an unusual number of foxgloves, and there were many abnormalities amongst them. Mrs. G. B. Longstaff exhibited on June 5th of that year a fine specimen of synanthy, and two specimens with spirally twisted stems on June 19th (see Proc. Linn. Soc. 1912–13, pp. 66, 67). In 1914 there was not such a large crop of foxgloves, and but two malformations were noticed: two spikes bearing synanthous flowers, one pure white and one spotted. The seeds from these were saved, sown in a box, and raised in a frame. The seedlings were planted out in the early spring. About sixty-five plants resulted, which all flowered this (their first) season, producing about seventy spikes. Of these about thirty bore flowers of the normal red, or of a pale pink colour, the upper flowers tending to white. About forty spikes bore white flowers, some spotted, others spotless. Two spikes with pink flowers exhibited synanthy, one withered prematurely, the other was white and dark spotted. About fourteen other spikes had synanthous flowers, some pure white, some dark spotted. As the spikes had not all opened, and the plants were planted closely, it was difficult to count with certainty. Prof. Dendy recalled the exhibition on June 16th, 1910, by Mr. N. C. Macnamara, of foxgloves grown by him at Chorley Wood, Herts, followed by a note on "Mutations in Foxglove Plants," read on November 16th, 1911 (see Proc. 1911–12, pp. 4–6), and claimed Miss Saunders's plants as descendants of these Hertfordshire foxgloves.

Mr. G. S. Boulger has published (Hiscoke & Son, Richmond, Surrey) as a penny pamphlet the interesting paper on "The History of Kew Gardens, showing the connection of Kew with the history of Botany," read at a recent meeting of the South-Eastern Union of Scientific Societies. It is exceedingly well

done, and contains in small compass a vast amount of information, partly derived from this Journal, concerning the numerous botanists, from William Turner onwards, whose names have been associated with the "royal village."

THE *Journal of Genetics* for July, with which a fifth volume is begun, contains a paper by Mr. B. Crane, of the John Innes Horticultural Institution, on "Heredity of Types of Inflorescence and Fruits in Tomato," and one by Mr. W. Bateson and Miss Caroline Pellew, director and student respectively of the same institution, "On the Genetics of 'Rogues' among Culinary Peas" (*Pisum sativum*). "Rogues" are plants in a crop which do not come true to the variety sown. The term is in use among seed-growers, and the remarkable feature shown by these investigations is that, although "thoroughly typical plants do occasionally throw rogues and certain intermediate forms, the rogues of whatever origin have offspring exclusively rogues." The general course of the phenomena is evidently quite unlike anything with which we are familiar in ordinary Mendelian inheritance. The papers are, as usual, admirably illustrated—the first by seven, the second by six, plates.

THE *Kew Bulletin* (no. 6, 1915) contains an interesting account of the work of Walter Hood Fitch (1817–92) from the pen of Mr. W. B. Hemsley, who gives a very full bibliography of his work—the more valuable in that much of his early work was unsigned. A rough approximate of the total of his published drawings is 9600, and doubtless reached 10,000: upwards of 5000 of these are coloured. A well-deserved tribute is paid to the artist's power of portraying plants from dried examples; "as a revivifier of herbarium specimens Fitch has never been surpassed, and perhaps never equalled." The same number of the *Bulletin* contains a monograph of *Phelipæa*, of which three species (one new, *P. Boissieri*) are described by Dr. Stapf, with an interesting historical introduction; and a useful paper by Mr. W. Dallimore on "The European Pines; their Commercial Importance and their Relationship to British Forestry." The preceding number (no. 5) is mainly devoted to an illustrated monograph of *Sansevieria* by Mr. N. E. Brown; fifty-three species are described, many of which are new. To those who remember the early days of the *Bulletin* when, owing to its irregular appearance, it ranked rather as a bibliographical curiosity than as an important botanical publication, its position under the present directorate is a gratifying example of progress.

IN a recent issue (vol. viii. no. xl., March, 1915) of *Notes from the Royal Botanic Garden, Edinburgh*, an interesting new genus —*Moultonia*—of *Gesneraceæ* is described and figured by Professor Balfour and Mr. W. W. Smith. It is allied to *Monophyllæa*, which the authors say they "only know from the description and figure given by Clarke" in his monograph of *Cyrtandreæ*": reference might perhaps have been made to Mr. Ridley's note on the genus in Ann. Bot. xx. 213 (April, 1906).

The moss-flora of Denmark has not been the subject of a special descriptive monograph since the publication of the *Flora Danica*. In the long interval of some sixty years great progress has been made in the study of Scandinavian bryology. It is therefore satisfactory to note that C. Jensen, a well-known Danish moss-student, is publishing in his *Danmark's Mosser* (Kobenhavn: Gyldendalske Boghandel, 1915—part I. pp. vii. 317, with six plates and numerous figures) a systematic account of the Bryophyta of Denmark and the Faeroe Islands. Part I. contains the three orders Hepaticales, Anthocerotales and Sphagnales, leaving the Andreæales and Bryales to be treated in the second part. The families, genera, species, &c., are adequately described, and are elucidated with keys and numerous figures. The systematic portion is preceded by an introductory sketch of the structure of the bryophyte plant. The work is essentially a student's handbook. The fact of its text being in Danish rather limits its usefulness among British bryologists.—A. G.

Beautiful detailed drawings of new Japanese mosses, comparable in quality, though not of course in quantity, with the fine plates of Bruch and Schimper's great work, the *Bryologia Europæa*, are published by Shûtai Okamura in his "Contributiones novæ ad Floram Bryophyton Japonicam" (in the *Journal of the College of Science*, Imperial University of Tokyo, xxxvi. Art. 7, 51 pp. 24 plates. Tokyo, 1915). Each of the new species is fully described in Latin. Other records are included for Japan, Sachalin, Liuchu and Corea. A new genus, *Meteoriella*, nineteen new species and four varieties are fully described in Latin; a few little-known species are redescribed, and new records for Japan, Sachalin, Liuchu and Corea are included. *Meteoriella* is related to *Meteoriopsis* Fleisch., but is at once distinguished by its binerved auriculate leaves.—A. G.

The part (vol. viii., part 7) of the *Transactions of the Linnean Society* (dated December 1914 but issued early in July) contains a paper, illustrated by three plates and figures in the text, by Mr. Arthur Samuel Horne entitled "A contribution to the Study of the Evolution of the Flower, with special reference to the *Hamamelidaceæ, Caprifoliaceæ,* and *Cornaceæ*."

In the course of paragraphs on "Women Gardeners at Kew" the *Times*, which has long since descended to the level of the cheaper daily press, informs us (August 7) that "a woman plant artist has been working for many years in the building devoted to the Index Kewensis, and there are several women also employed on the Index itself"! This description of the object and purpose of the Kew Herbarium will astonish those who are accustomed to regard "the building" as the home of one of the great herbaria of the world; but it is on a par with other utterances of the *Times*, an example of which was given on **p. 95 of this Journal.**

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BRITISH AND FOREIGN

EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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THE JOURNAL OF BOTANY was established in 1863 by Dr. Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of general Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains. In 1896 it became necessary to increase the size of the Journal, owing to the number of papers sent for publication: the number of plates was at the same time augmented.

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CEYLONESE MOSSES

Collected by the Rev. C. H. Binstead in 1913.

By H. N. Dixon, M.A., F.L.S.

(Concluded from p. 267.)

Myuriaceæ.

Myurium rufescens (Hornsch. & Reinw.) Fleisch. Tree, N. E., a form with a few flagelliform, minute-leaved ramuli (128); rock on roadside bank, N. E., *c. fr.* (301); tree near waterfall, N. E., *c. fr.* (130); stem of shrub in open, Ped., *c. fr.* (300).

Forma pendula Fleisch. Ped. (132). A remarkable plant, having the long, pendulous stems mostly filiform or stolonaceous, intermittently set with short, normally foliate branches; hence, with very much the general appearance of some Barbellæ, e.g. *B. compressiramea* and *B. rufifolia*.

M. Warburgii (C. M.) Fleisch. seems to me very doubtfully separate from this species.

Neckeraceæ.

Trachyloma indicum Mitt. Tree by stream in shade, Rombodde Pass, N. E. (304).

Pterobryopsis Wightii (Mitt.) Broth. Peradeniya Gardens, Kandy (33).

P. crassicaulis (C. M.) Fleisch. Tree, N. E. (303). Hitherto, I believe, only recorded from Java and Sumatra. The axillary gemmæ are very abundant.

P. aurantia (C. M.) Fleisch. Trees and rocks, N.E. (131, 134, 306). No. 134, from a large rock in open, is of a different habit from the usual plant, having the leaves densely arranged and imbricate when dry, much less spreading, so as to have the appearance of *P. crassicaulis*.

P. flexipes (Mitt.) Fleisch. N. E. (126 *a*).

P. Walkeri Broth. Tree, N. E. (302).

P. frondosa (Mitt.) Fleisch. N. E. (125); wood near church, N. E., *c. fr.* (129).

Papillaria fuscescens (Hook.) Jaeg. Rocky bank on roadside, &c., N. E. (135, 309, 312).

P. semitorta (C. M.) Jaeg. Ped. (148); N.E. (144, 311).

P. cuspidifera (Tayl.) Jaeg. Stonework by roadside, and tree-root, near N. E. (217, 219).

Meteorium Miquelianum (C. M.) Fleisch., forma longipila. Jungle near stream, N. E. (305).

M. retrorsum Mitt. Roadside, half-way to Hakgala, N. E. (141); Ped., 8000 ft. (151).

Aërobryopsis longissima (Doz. & Molk.) Fleisch. N. E. (307); on slender pendulous tree branches, in shade, near Hakgala, N. E., *c. fr.* (226).

Var. *densifolia* f. *robusta* Fleisch. Roadside bank, N. E. (133, 146).

Aërobryidium attenuatum (Thw. & Mitt.) Fleisch. Roadside bank near Hakgala (137); N. E. (146).

Aë. punctulatum (C. M.) Dixon, comb. nov. (*Pilotrichum punctulatum* C. M.) N. E. (126).

Floribundaria floribunda (Doz. & Molk.) Fleisch. Stream under Ped. (293); N. E. (344); boulder by stream, Udapassellawa (410).

Barbella convolvens (Mitt.) Broth. Tree branches in shade by road near lake, N. E. (139).

Meteoriopsis reclinata var. *ceylonensis* Fleisch. Common about N. E. (136); Ped. (313).

Diaphanodon blandus (Harv.) Ren. & Card. Ped., 8000 ft. (138, 149); tree by stream, Rombodde Pass, N. E., male (322).

D. javanicus Ren. & Card. f. *robustior* Ren. & Card. Trunk of orange tree, tea gardens, Nanuoya (429). A very striking plant, with highly dimorphous stems, the young undivided shoots with large brownish leaves forming a strong contrast with the small-leaved, dark green, pinnate stems.

Trachypus Massartii Ren. & Card. Tree in wood by church, N. E. (213); boulder in stream, N. E. (321), a form which appears to connect *T. Massartii* with the following species; shaded rock by stream, Udapassellawa (412).

T. tenerrimus Broth. apud Herzog in Hedw. L. 135. Decayed wood by stream, N. E. (350).

T. Nietneri C. M. Bough above stream in jungle under Ped., N. E. (314); dripping roadside rock, N. E., cum setis (320).

T. bicolor Hornsch. & Reinw. Ped. (142), perhaps referable to the following var.

Var. *hispidus* (C. M.) Par. Trees and rocks, N. E. (308, 310, 317).

Trachypodopsis crispatula (Hook.) Fleisch. N. E., Ped. at 8000 ft., &c. (140, 147, 150).

Orthorrhynchium Nietneri C. M. Rotting wood near waterfall, N. E. (143).

Neckera himalayana Mitt. Near waterfall, N. E. (319); wet boulders in stream, in shade, Rombodde Pass (324).

Neckeropsis Lepineana (Mont.) Fleisch. Projecting at right angles from vertical rock, Udapassellawa (409).

Homaliodendron scalpellifolium (Mitt.) Fleisch. Tree in woody jungle, near church, N. E. (323), a small-leaved, densely branched form.

H. ligulæfolium (Mitt.) Fleisch. Trees in jungle, 8000 ft., Ped. (127); branches of tree by stream in jungle, under Ped., *c. fr.* (318).

Thamnium subserratum (Hook.) Besch. Shaded rock by stream, N. E. (206, 227); boulder in shade by stream, near Hakgala (215); rocks in stream under Ped. (390).

Camptochæte (?) **thamnioides** Broth. & Dixon, sp. nov. (Pl. 540, fig. 6.) Caules *rigidi, tenelli*, circa 2 cm. alti, dense intertexti, plusminusve conferte subcomplanate ramosi, subdendroidei, cæspites densiusculos *nitentes* olivaceo-virides formantes; rami breves, tenelli, subcurvati, sæpe ramulos angustifolios subflagelli-

formes emittentes. Folia *valde inæqualia*, ·5 mm. longa vel multo minus, *complanata*, *distantia*, *e basi angusta oblongo-elliptica*, *breviter acuta*, subplana, marginibus planis, infra obsolete apicem versus *grossiuscule conferte dentatis*, chlorophyllosa, subpellucida, *omnino enervia*; cellulæ breviter lineares, subvermiculares, parietibus firmis, subincrassatis, infra elongate, anguste lineares, ad angulos vix mutatæ, apicem versus breviores, paullo latiores; omnes chlorophyllosæ, læves. Cetera nulla.

Hab. On vertical face of rock in shade above pool, N. E. (388).

The position of this plant is somewhat uncertain. In habit and areolation it much resembles some of the smaller species of *Porotrichum* and *Thamnium*, e. g. *T. pumilum* (H. f. & W.), but the nerveless leaves remove it from those genera. None of the known species of *Camptochæte* very closely resemble it, and the exclusively austral distribution of that genus, of which New Guinea is the most northerly limit, is also somewhat against the inclusion of the present plant, but it does not seem more at home in any other position.

Isothecium ceylonense Fleisch. Tree below waterfall, N. E. (140 *a*, 212).

I. rigidissimum (C. M.) Fleisch. Ped. (315); tree below waterfall, N. E. (377).

Entodontaceæ.

Clastobryum ceylonense Broth. apud Herzog in Hedw., L., 137. Tree at 8000 ft., Ped. (211). A very pretty species, gathered by Mr. Binstead in almost the same station, apparently, as the original by Dr. Herzog.

C. oligonema Card. in herb., ined. A few stems with *Daltonia contorta*, from jungle, N. E. (339 *a*). I have a fine specimen of it also from Ped., 8200 ft., where it was collected by Father Blatter in 1909. These agree quite well with the original plant, sent me from Kodi Kanal, Madura, by M. Cardot.

Symphyodon Perrottetii Mont. Ped. (214, 228).

Forma *viridis*. Branches of tree by stream, under Ped., male (316); fern root in shade by falls, N. E., female (207). Both these have the leaves quite green, not ochraceous, and much resemble some species of *Calyptothecium*, e. g. *C. subcrispulum* (Broth.).

S. erraticus (Mitt.) Jaeg. Roadside bank, N. E. (180); Ped. (184); shaded branch of tree over stream, Rombodde Pass (387).

Campylodontium flavescens (Hook.) Bry. Jav. Fallen tree boughs, Peradeniya Gardens (39), cum setis; a bright green, not yellowish form.

Erythrodontium julaceum (Hook.) Par. Tree stump and rock, Kandy (32, 35), the latter a form with the stems regularly and prettily pinnate, with short dense pectinate branches; boughs of trees, Peradeniya Gardens (40).

Stereophyllum papillidens Card. in herb., ined. Peradeniya Gardens (38). This was sent to Dr. Brotherus, and determined by him as a new species, for which he proposed the name *S. Binsteadii*, but I have since found it to be identical with an

unpublished species from Madura, of which M. Cardot sent me a specimen.

Fabroniaceæ.

Fabronia patentissima C. M. Tree, N. E., *c. fr.* (351). This plant shows a good deal of variation in leaf arrangement and position, denticulation of margin, &c., as does also Thwaites' specimen in Herb. Mus. Brit. (C. M. 252); and I feel very doubtful whether *F. patentissima* and *F. Nietneri* can be separated from one another.

F. Beccarii Hampe. Stem of tea bush, Udapassellawa, *c. fr.* (411).

F. secunda Mont. Base of cedar, N. E., *c. fr.* (199).

Hookeriaceæ.

Daltonia contorta C. M. Roadside tree, N. E., *c. fr.* (233); jungle, N. E. (339).

Distichophyllum Montagneanum (C. M.) Bry. Jav. Shady bank and rocks near waterfall, N. E. (76, 325, 326); shaded banks of stream, Rombodde Pass (337); shaded bank of jungle stream, Nanuoya (421, 422).

D. ceylanicum (Mitt.) Par. Near waterfall, N. E. (334, 363); tree roots, Rombodde Pass (373).

D. limpidum Thw. & Mitt. Wet rocks near waterfall, N. E. (159, 163, 330).

Hookeriopsis utacamundiana (Mont.) Broth. Damp shady banks near waterfall, mostly fruiting (162, 328, 372); tree roots by cascade, Hakgala, *c. fr.* (164); wet rocks in jungle, Nanuoya (420, 425).

Forma *viridis*. Damp shady bank near waterfall, N. E., *c. fr.* (225); leaves entirely green, only a very few of the oldest showing traces of red.

Lepidopilidium furcatum (Thw. & Mitt.) Broth. Decayed wood in shade near cascade, near Hakgala (165, 195).

Hookeria acutifolia Hook. Shady banks of streams, N. E. (171–174, 327, 336); Rombodde Pass (329).

Hypopterygiaceæ.

Hypopterygium javanicum (Hampe) Jaeg. Rock near waterfall, N. E. (160); base of trees in very damp young wood, N. E. (331), a form with very numerous brood-bodies.

H. apiculatum Thw. & Mitt. Shaded rock near waterfall, N. E., *c. fr.* (161, 333).

H. ceylanicum Mitt. Trees in wood, N. E. *c. fr.* (335, 338); shaded rock by stream, Udapassellawa, *c. fr.* (332).

Rhacopilaceæ.

Rhacopilum indicum Mitt. Various localities, mostly sterile; in fruit, N. E. (140 *a*); Hakgala (178).

Anomodontaceæ.

Haplohymenium filiforme (Thw. & Mitt.) Broth. Tree, Kandy (21).

THUIDIACEÆ.

Claopodium prionophyllum (C. M.) Broth. N. E. (366).

Thuidium plumulosum (Doz. & Molk.) Bry. Jav. Shaded sandstone rock, Kandy, cum setis (36).

T. glaucinum (Mitt.) Bry. Jav. Rotting stump, &c., N. E. (152, 156, 157, 340).

T. cymbifolium (Doz. & Molk.) Bry. Jav. In various localities about N. E., often fruiting (153–155, 158, 342, 343).

HYPNACEÆ.

Macrothamnium macrocarpum (Hornsch. & Reinw.) Fleisch. Trees in jungle, Ped., 8000 ft. (223); rock in stream, N. E. (229); wet rock in splash of cascade, under Ped. (367).

M. pseudo-striatum (C. M.) Fleisch. Trees, &c., Ped., *c. fr.* (175, 189, 190); tree and shaded rock near stream, Rombodde Pass, *c. fr.* (374, 379). The strong dimorphism of the leaves—those of the stem and stouter shoots being large, wide, suborbicular and more or less spreading when dry, those of the smaller branches and branchlets much smaller, narrower and pointed, erect when dry—is a striking feature of this species. Brotherus places it in the section without differentiated alar cells, but the clearly marked alar cells appear to me to be one of the chief characters. Mitten seems to have misunderstood this plant, specimens of his so named (Bhotan, Griffith, and Kumaon, Strachey and Winterbottom, No. 90, &c.) certainly belong to *M. macrocarpum*.

Ctenidium lychnites (Mitt.) Broth. Various localities near N. E., sterile (201, 203, 205, 357, 376); Ped., *c. fr.* (182, 210); N. E., *c. fr.* (346, 347).

Ectropothecium cyperoides (Hook.) Jaeg. Decayed wood in jungle, &c., N. E., *c. fr.* (187, 196, 345); dead bark by stream, &c., Udapassellawa, *c. fr.* (416, 418).

E. tuberculatum (Mitt.) Jaeg. Shaded sandstone wall, near English church, N. E., *c. fr.* (30).

E. Zollingeri (C. M.) Jaeg. N. E. (389).

E. incubans (Hornsch. & Reinw.) Jaeg. Peradeniya Gardens, Kandy, *c. fr.* (19). There can, I think, be no doubt of the identity of this plant with the *Hypnum incubans* of Hornsch. & Reinw., judging by the description in C. M. Syn. ii. 306 (it has not been possible to see a specimen of the authors', but it agrees well with a Javan specimen in Hampe's herbarium). It differs from *E. dealbatum* in the bright green colour, leaves more regularly falcate-deflexed, and shorter cells.

Stereodon cupressiformis (L.) Brid. var. *elatus* Schimp. Roadside bank in open, N. E. (216).

Acanthocladium ceylonense Broth. & Dixon, sp. nov. (Pl. 540, fig. 7.)

Sat robustum; caules rigidi, infra arcte cohærentes, haud radiculosi, pallide fusci, supra virides, *nitentes*, *acutissime cuspidati*, breviter distanter subpinnate ramosi. Folia *inferiora rigide patentia*, suprema in penicillium angustum peracutum aggregata,

2 mm. longa, e basi contracta subamplexicauli *oblongo-lanceolata* raptim in acumen longum, flexuosum, anguste loriforme, subdenticulatum angustata; cellulæ perangustæ, infimæ pallido-flavæ, alares circa trinæ *magnæ*, elongatæ, hyalinæ. Folia perichætialia superne *argute dentata*. Seta circa 2 mm. longa, tenuis, purpurea, lævis; theca parva, horizontalis, deoperculata circa 2 mm. longa, *anguste elliptica vel subcylindrica*, sub ore contracta, collo distincto *grosse tuberculato seu rugoso*; operculum tenui-rostratum deflexum, *thecæ longitudinem æquans*.

Hab. Nuwara Eliya (348); also on vertical cliff by water, N. E., with *Camptochæte thamnioides*.

Perhaps nearest to *A. pseudo-tanytrichum* (Bry. Jav.), but very distinct in the characters noted above, the narrower leaves, very cuspidate apices of the stems, sharply toothed perichætial bracts, and capsule with rugose neck and long acicular lid.

It has the habit of some species of *Sematophyllum*, e. g. *S. pungens* (Sw.),

Isopterygium taxirameum (Mitt.) Jaeg. Kandy (26–28, 31); near waterfall, N. E. (358); Nanuoya (427), a very straggling, pale coloured form.

I. arquifolium (Bry. Jav.) Jaeg. Shaded bank of stream, &c., N. E. (208, 380, 384 *a*).

I. distichaceum (Mitt.) Jaeg. By stream, N. E. (371).

I. minutirameum (C. M.) Jaeg. Bases of rotting bamboo stems, &c., Peradeniya Gardens, *c. fr.* (17, 22, 23).

I. albescens (Schwaeg.) Jaeg. Shady bank of stream, N. E., *c. fr.* (386), det. Brotherus; a very different-looking plant from the usual forms, being lax, and bright green in colour.

Plagiothecium ceylonense Broth. ined. Rock in stream, deeply shaded, near Hakgala (222), det. Brotherus; by stream, &c., N. E. (353, 359, 369); shaded rock near stream, Nanuoya (424), a robust form with stems 4 in. long, and leaves much denser and less complanate than usual.

Taxithelium Dozyanum (C. M.) Broth. Fern roots in shade by waterfall, N. E., *c. fr.* (170); in deep shade on wet rock by stream, Rombodde Pass, *c. fr.* (391).

T. vivicolor Broth. & Dixon. Rock in stream, and smooth rocks in shade near waterfall, N. E. (204, 354).

Taxithelium (Polystigma, Aptera) **Binsteadii** Broth. & Dixon, sp. nov. (Pl. 540, fig. 8.)

T. planissimo Broth. affine. Caulis repens, ad corticem arcte adhærens, *dense pinnatus*, *ramis valde complanatis subæqualibus*, circa ·5 cm. longis; subnitescens, læte viridis, sat robustus. Folia *percomplanata*, dorsalia appressa, subplana, lateralia patentia, uno latere late incurvo concava, pellucida, e basi valde contracta amplexicauli *oblongo-lanceolata*, caulina anguste acuminata, 1 mm. longa, ramea latiora, breviter acuminata vel acuta, toto margine denticulata; cellulæ perangustæ, dorso seriatim plusminusve (sæpe indistincte) tenuiter papillosæ; alares *paucæ*, *haud magnæ*, *bene notatæ*, *hyalinæ*. Perichætialia pallida, suberecta, *in acumen longum*, *loriforme*, *flexuosum argute dentatum* producta. Seta

2 cm. longa, lævis. Theca brevis, inclinata, cernua, sicca deoperculata sub ore haud constricta, operculo *conico*.

Hab. Branch of tree by stream, Kirklees, Udapassellawa (413).

Distinguished from *T. planissimum* Broth. (in Hedw. L., 141) and from *T. isocladum* (Bry. Jav.) by its smaller size, less papillose, denticulate leaves, longer, smooth seta, conical lid, &c.

Taxithelium (ANASTIGMA) **isopterygioides** Dixon, sp. nov. (Pl. 540, fig. 9.)

T. subretuso (Mitt.) affine. *Saturate viride*, nitens, *percomplanatum*; caulis irregulariter subpinnatim ramosus; folia omnia complanata, uno latere late inflexo, caulina *late ovalia*, circa 1 mm. longa, plerumque *valde rotundo-obtusa*, ramea angustiora, *obtusa vel breviter late acuta*, apicem versus plusminus argute denticulata, omnino *enervia*; cellulæ anguste lineares, *læves*, chlorophyllosæ, basilares *ad unum vel alterum latus magnæ, rectangulares, numerosæ, subhyalinæ, alam plusminus magnam bene notatam instruentes.* Dioicum videtur. Seta unica juvenis brevis lævis; fol. perichætialia breves, externa subsecunda brevissime late acuminata, interna longiora, *erecto-adpressa, subvaginantia, stricta, obtuse late acuminata.* Cetera nulla.

Hab. Near stream, Udapassellawa (415).

The generic position of this plant is not quite certain, but it is probably a *Taxithelium*, near to *T. subretusum* (Mitt.), *T. glossoides* (Bry. Jav.), &c., but the very complanate habit, quite smooth, nerveless leaves, with the conspicuous, numerous alar cells, separate it at once. The alar cells vary somewhat according to the position of the leaf on the stem, and may be quite inconspicuous; as a rule, however, they form a large and conspicuous patch on one side of the leaf-base, while very little developed on the other.

Vesicularia caloblasta Broth. & Dixon, sp. nov. (Pl. 540, fig. 10.) Sat robustum; caules elongati, distanter *irregulariter ramosi*, vix pinnati, subnitentes, pallide virides, molles. Folia caulina lateralia complanato-decurva, sicca paullo contracta, flexuosa, late cordato-ovata, perconcava, *cito in acumen longiusculum subpiliforme integrum* angustata. Folia ramea minora, angustiora, multo brevius acuminata; omnia brevissime costata, sæpius uninervia, *perpellucida*, marginibus integris. Areolatio *perlaxa*, e cellulis *echlorophyllosis*, rhomboideo-hexagonis, *magnis, ad 24 μ latis* (2–3 × 1), infra sensim elongatis, infimis angustioribus.

Seta *longa*, 2–3 cm., tenuis, flexuosa, pallida, apice arcuata; theca parva, pendula, vix 2 mm. longa, fusca, breviter ovalis, collo brevi abrupto, operculo conico acute rostellato.

Hab. Shady bank near waterfall, N. E. (193); wet shaded tree root, Rombodde Pass (375); N. E. (352); Nanuoya (419); mostly *c. fr.*

Allied to *V. reticulata* (Doz. & Molk.), but with still wider areolation, more concave leaves, and longer seta. A South Indian plant, *V. perreticulata* Broth. ined., has similar areolation, but a considerably shorter seta, and toothed stem leaves; the margin in the present species is usually quite entire, rarely very slightly and indistinctly denticulate.

Leucomiaceæ.

Leucomium limpidum Thw. & Mitt. Shaded bank of stream, Kirklees, Udapassellawa, *c. fr.* (397, 414).

Sematophyllaceæ.

Chionostomum rostratum (Griff.) C. M. On cedar, N. E., *c. fr.* (191).

Rhaphidostegium leptorrhynchoides (Mont.) Jaeg. Tree roots in shade, &c., N. E. (176, 179, 185); trees, Ped., *c. fr.* (192), a form with beautifully regular foliation.

R. subhumile (C. M.) Jaeg. Peradeniya Gardens, *c. fr.* (18, 20, 37); Kandy (25); rotting stump, N. E., *c. fr.* (186).

R. tristiculum (Mitt.) Jaeg. Roadside tree, in shade, N. E. (349).

Sematophyllum cuculligerum (Bry. Jav.) Jaeg. Tree, N. E. (200); a pretty species, distinct in its sharply denticulate narrow leaves, and the masses of brood filaments at or near the tips of many of the branches.

S. punctuliferum (Thw. & Mitt.) Jaeg. Ped., on trees, sterile and *c. fr.* (198, 210, 211 *a*, 220). Extremely near to *S. Braunii*.

S. hyalinum (Reinw.) Jaeg. Tree, Ped. (218, 221).

Rhegmatodontaceæ.

Macrohymenium læve Thw. & Mitt. Foot of tree by road, N. E., *c. fr.* (181); rotting stump in jungle, N. E., *c. fr.* (183). No 181 has some characters of *M. Mülleri* (Doz. & Molk.)—leaves homomallous, seta only very faintly roughened above; but 183 with leaves not homomallous, and processes of endostome not perforate is clearly *M. læve*, though the seta is just as in 181, which it connects therefore with this species.

Brachytheciaceæ.

Pleuropus fenestratus Griff. Roadside rock, N. E., *c. fr.* (202) foot of Ped. (361).

Brachythecium procumbens (Mitt.) Jaeg. Roadside bank, near N. E., *c. fr.* (224).

B. plumosum (Sw.) Br. & Schimp. Rock in stream under Ped., *c. fr.* (356, 360); N. E., *c. fr.* (385).

B. oxyrrhynchum (Doz. & Molk.) Jaeg. Damp stone in deep shade by rivulet, foot of Ped., *c. fr.* (177); rock in shaded brook near Hakgala, *c. fr.* (209). No. 177 has the seta scarcely roughened, but I think it can only be considered a slight form of this species; *B. oxystegum* shows a similar variation.

Rhynchostegiella humillima (Mitt.) Broth. Young tree in jungle, N. E., *c. fr. immaturis* (188).

Rhynchostegium herbaceum (Mitt.) Jaeg. By stream, Kirklees, Udapassellawa, *c. fr.* (408).

R. Hookeri Sauerb. Peradeniya Gardens (29).

R. javanicum (Bél.) Besch. Roadside bank, Kandy, *c. fr.* (24); shaded stony bank, N. E. (362)

Explanation of Plate.

Fig. 1. *Trematodon brevisetus* (type); *a*, plant, nat. size; *b*, capsule, × 4; upper cells, × 200.—Fig. 2. *Microcampylopus subnanus* (Nuwara Eliya, *Binstead*); *a*, spores, × 200.—Fig. 3. *Fissidens aberrans* (type); *a*, sterile stem, × 4; *b*, fertile do., × 4; *c*, leaf apex, × 200.—Fig. 4. *Macromitrium assimile* (type); *a*, plant, nat. size; *b*, leaf, × 20; *c*, upper marginal cells, × 200.—Fig. 5. *Bryum ceylonense* (type); *a*, stem, nat. size; *b*, upper leaf, × 20; *c*, upper, *d*, basal cells, × 200; *e*, portion of peristome, × 80.—Fig. 6. *Camptochæte thamnioides* (type); *a*, stem, nat. size; *b*, branches, × 10; *c*, leaf, × 20; *d*, leaf apex, × 40; *e*, upper cells, × 200; *f*, basal alar cells, × 200.—Fig. 7. *Acanthocladium ceylonense* (type); *a*, stem, nat. size; *b*, *b'*, leaves, × 20; *c*, alar cells, × 200; *d*, capsule, × 8; *e*, apex of perichætial bract, × 40.—Fig. 8. *Taxithelium Binsteadii* (type); *a*, stem, nat. size; *b*, *b'*, leaves, × 20; *c*, upper cells, × 200; *d*, alar cells, × 200.—Fig. 9. *Taxithelium isopterygioides* (type); *a*, stem, nat. size; *b*, leaf, × 20; *c*, alar cells, × 100.—Fig. 10. *Vesicularia caloblasta* (type); *a*, upper cells, × 200.

NEW URTICACEÆ FROM TROPICAL AFRICA.

By Dr. A. B. Rendle, F.R.S.

In elaborating the group of families comprised in the aggregate *Urticaceæ* of Bentham and Hooker for the *Flora of Tropical Africa*, I have found, mainly in the herbaria at Kew and the British Museum, a few new forms. In order to conform to the International Rules of Nomenclature, it is necessary to publish Latin diagnoses, and, with the concurrence of the Director of the Royal Gardens, these are submitted herewith, so far as concerns the genera *Celtis* and *Dorstenia*.

Celtis Tessmannii, sp. nov. *Arbor* ut apparet decidua, ramulis tenuibus hirtellis, ultimis ad 1·5 mm. crassis internodiis 1·2–2 cm. longis. *Folia* breviter petiolata, in sicco tenuiter papyracea, oblongo-elliptica, asymmetrica, acuminata, apice mucronata, basi valde inæquali, margine integra, 5–11 cm. longa, 2–4 cm. lata, in facie superiore, nervo mediano breviter hirtello excepto, glabra, in facie inferiore pilis brevibus albidis scabridula, in nervis hirtella; nervis lateralibus utrinque 3–5, ascendentibus, subter veluti venulis prominulis; petiolus ad 2 mm. longus, hirtellus. *Stipulæ* anguste subulatæ, hirtellæ, ad 4 mm. longæ. *Sepala* circa 1 mm. longa, dorso pilosella. *Ovarium* ovoideum, dense pilosum, stigmata alte bifida, ramis patentibus.

Hab. West Tropical Africa. Hinterland of Spanish Guinea, Mabungo, at 450 m., *Tessmann*, B. 25! Herb. Berlin.

Near *Celtis Zenkeri* Engl., from which it is distinguished by the almost sessile unequal-sided leaves and very slender stipules.

Celtis insularis, sp. nov. *Arbor* eximia trunco recto et ligno albo (Welwitsch), ramulis tenuibus juventute glabris. *Folia* elliptica, acuta vel acuminata, basi rotundata vel subacuta et interdum inæqualia, margine integra, 7·5–15 cm. longa, 2·5–7·5 cm. lata, tenuiter coriacea, glabra, in facie superiore minute punctulata, usque ad apicem 3-nervata, nervis subter prominentibus, venulis subparallelis, prominulis; petiolus circa 1 cm. longus, glaber. Flores haud visæ. *Drupa* ellipsoidea, apice angustata, circa 1·5 cm. longa, in sicco rugosa et pallide brunnea.

Celtis sp. Planch. in Ann. Sci. Nat. ser. 3, x. 307, and in DC. Prodr. xvii. 186; Benth. in Hook. Niger Flora, 525. *C. Prantlii* Priem. ex Engl. Notizbl. K. Bot. Gart. Berlin, iii. 23, as regards specimens from St. Thomas and Princes Islands.

Hab. West Tropical Africa. St. Thomas Island, *Don*, 35! *Welwitsch*, 6304! *Quintas*, 144! Princes Island, *Mann*, 1113! Herb. Kew; Herb. Mus. Brit.

Near the Indian *C. Wightii* Planch., with which Planchon suggested it was conspecific, but distinguished by its larger fruits.

Celtis Brownii, sp. nov. *Arbor* parva, monoica, ramulis glabrescentibus. *Folia* breviter petiolata, demum tenuiter coriacea, oblongo-elliptica vel late elliptica, apice plus minus acuminata, basi inæquali obtusa vel rotundata, margine integra vel superne dentibus paucis brevibus inæqualibus instructa, 7–14 cm. longa, 3–7·5 cm. lata, glabra, trinervata, nervis supra subimpressis, subter prominentibus, venulis parallelis prominulis; petiolus ·6–1·2, rarius 2 cm., longus. *Inflorescentiæ* vix petiolum excedentes vel ad tertiam partem folii attingentes; flores masculi multi, sessiles vel breviter pedicellati; flores fertiles pauci, superiores, longius pedicellati. *Sepala* concava, elliptica, dorso puberula, vix 2 mm. longa. *Ovarium* glabrum, basi pilis albis dense cinctum; stigmata late linearia, crassa, subcompressa, apice breviter bilobata. *Drupa* ellipsoidea, pallide brunnea, 1 cm. longa.

Hab. Uganda. Mabira Forest, *E. Brown*, 462! Chagwe, *Ussher*, 57! 81! Herb. Kew; Herb. Mus. Brit.

Some confusion has arisen with regard to the species described and figured by Burmann, Rar. Afric. Plant. 242, t. 88, as *Celtis foliis subrotundis, dentatis, flore viridi, fructu luteo.* Thunberg includes this as a synonym of his *Rhamnus celtifolius*, Fl. Cap. ii. 72 (1818), while Planchon (in Ann. Sci. Nat. ser. 3, x. 296) includes in his species *Celtis Burmanni* both the citation of Burmann and the species of Thunberg. By the kindness of Dr. O. Juel, of Upsala, I have been able to see a photograph of Thunberg's specimens, and there seems little doubt, as Dr. Juel agrees from his examination of the actual specimens, that *R. celtifolius* Thunb. is identical with *R. prinoides* L'Her.; Thunberg himself at one time took this view, as one of the two specimens in his herbarium bears in his own hand both names, namely, *R. prinoides* and *R. celtifolius*.

On the other hand, there is, I think, no doubt that the plant described and figured by Burmann is only the common and very variable *Celtis Kraussiana* Bernh.; the drawing of the female flower, with its two large spreading stigmas, is especially suggestive of this species and quite different from *Rhamnus*. *Celtis Burmanni* Planch. is a synonym of *C. Kraussiana*, except so far as relates to *Rhamnus celtifolius* Thunb.

Dorstenia stipulata, sp. nov. *Suffrutex*, caule foliato glabrato, e basi radicante erecto, superne herbaceo, circa 2·5 dm. alto, 3 mm. crasso, internodiis sæpius 1–2 cm. longis. *Folia* obovato-elliptica, apice obsolete acuminata, obtusa, basi cuneata obtusissima vel obscure cordata, margine subundulata, 11–12 cm. longa, 4·5–5·5 cm. lata, glabra; nervis lateralibus utrinque 8–9, ascen-

denti-curvatis et infra marginem conjunctis, in facie superiore impressis, subtus veluti venulis prominentibus; petiolus crassus, 1–2 cm. longus. *Stipulæ* e basi anguste triangulari lineari-subulatæ, 8–12 mm. longæ, persistentes. *Pedunculi* in axillis solitarii vel gemini, 2 cm. longi; receptaculum stellato-orbiculare 8 mm. diametro, ei *D. ophiocomæ* simile, bracteis 8, filiformibus, 4 cm. longis.

Hab. West Tropical Africa. Mfoa, 85 miles east of Gaboon, in forest, *Bates*, 518! Herb. Kew; Herb. Mus. Brit.

The soft wood is impregnated with a yellow resin. Closely allied to *D. ophiocoma* Engl., but distinguished by its much longer persistent stipules.

Dorstenia laikipiensis, sp. nov. *Herba* parva inferne suffrutescens, caule petiolisque dense hirtellis. *Folia* breviter petiolata, obovata, apice obtusa vel rotundata, basi obtusa vel obscure cordata, margine subundulata, 7·5–9 cm. longa, 3–4 cm. lata, in facie superiore glabra, subtus sparse pilosa præcipue in nervis, nervis lateralibus utrinque circa 5, sursum curvatis et infra marginem conjunctis, petiolus 6–8 mm. longus. *Stipulæ* subulatæ persistentes. *Pedunculi* in axillis solitarii; receptaculum late convexum, hirtellum, disco orbiculare circa 8 mm. diametro, margine bracteis circa 15 valde inæqualibus instructa. *Endocarpium* crustaceum, rugosum, circa 2 mm. diametro.

Hab. British East Africa. Laikipia Plains, 6000 to 6500 ft., *Battiscombe*, 61! Herb. Kew.

The numerous bract-arms of the receptacle vary remarkably in development from mere triangular projections 2 mm. in length to thread-like arms nearly 2 cm. long.

Near *D. mungensis* Engl., from which it is readily distinguished by its blunt not acuminate leaves.

Dorstenia Brownii, sp. nov. Planta caulibus herbaceis 22–30 cm. altis, e rhizomate tenui lignoso, ramoso, circa 2 mm. crasso, oriundis, interdum ramosis, pæne ad basin foliatis, internodiis 1–2 cm. longis, veluti petiolis puberulis cum pilis longioribus rigidis in parte juvenili interspersis. *Folia* in sicco tenuiter papyracea, anguste obovata vel cuneata, apice rotundato vel breviter acuminato, mucronulato, basi obtusa, margine supra medium sinuata, 5–9 cm. longa, 2½–3 cm. lata, superne atrato-viridia et sparse strigosa, subtus pallidiora et magis pilosa præcipue in nervis; nervis lateralibus utrinque 4–6, ascendentibus, subtus prominulis; petiolus 1·2–3 cm. longus. *Stipulæ* anguste lineari-subulatæ persistentes, usque ad 4 mm. longæ. *Pedunculi* breves, ·8–1 cm. longi, tenues, in quaque axilla in parte caulis superiore 1–3, veluti dorso receptaculi orbicularis convexo hirtelli, disco circa 6 mm. diametro, margine dentibus triangularibus acutis numerosis (circa 18) 1·2–1·5 mm. longis instructa. *Flores* masculi diandri, perigonii segmenta 2, crassiuscula, sublunata, antheræ brunneo-purpureæ; flores fœmineæ sparsæ, stylo breviter bifido. *Drupa* subglobosa; endocarpium 1·5 mm. diametro, subverruculosum.

Hab. Uganda. Mabira Forest, at 4000 ft., *E. Brown*, 460! Herb. Mus. Brit.

A very distinct species characterized by the round disc of the receptacle fringed with short teeth. Allied to *D. quercifolia* R. E. Fr., which, however, grows from a fleshy tuber-like rhizome.

Dorstenia Tayloriana, sp. nov. *Suffrutex* caule e basi radicante erecto et circa 12·5 cm. alto, parte juvenili veluti petiolis dense hirtella. *Folia* breviter petiolata, membranacea, oblanceolata, apice obtuso vel rotundato, apiculato, ad basin obtusam vel obscure cordatam angustata, margine undulata, 8–9 cm. longa, circa 2·5 cm. lata, in quaque facie scabridula; nervis lateralibus utrinque 6, ascendentibus et infra marginem conjunctis, prominulis; petiolus circa 4 mm. longus. *Stipulæ* parvæ, lineari-subulatæ, deciduæ, circa 2 mm. longæ. *Pedunculi* in axillis superioribus solitarii, 1·2–2 cm. longi, sparse pilosi; receptaculum dorso sparse pilosum, disco anguste ovali, 2 cm. longo, 7 mm. lato, utrinque angustato et bractea lineari circa 5 cm. longa instructo, margine dentibus inæqualibus 2–6 mm. longis armata. *Flores* masculi 3-andri, pistillo centrali abortivo; flores fœminei in linea mediana positi, stylo bifido ex ore perianthii tubi angusto exserto.

Hab. British East Africa. Rabai Hills, Mombasa, *W. E. Taylor*! Herb. Mus. Brit.

Near *D. poinsettiæfolia* Engl., but at once distinguished by the long terminal bracts, which are more than twice the length of the receptacle.

Dorstenia equatorialis, sp. nov. *Suffrutex* caule superne foliato et pilis brevissimis glandulosis sparse induto. *Folia* breviter petiolata, in sicco membranacea, obovato-elliptica, breviter acuminata, infra medium ad basin angustam obtusam angustata, margine leviter undulata, 12·5–13 cm. longa, 4–5·5 cm. lata, glabra, nervis lateralibus utrinque 7–10, sursum arcuatis et infra marginem conjunctis, subtus prominentibus, petiolus 6–8 mm. longus. *Stipulæ* longæ, lineari-angustatæ, 8–10 mm. longæ, persistentes. *Pedunculi* in axillis superioribus solitarii, petiolos excedentes; receptaculum haud maturum, ellipticum, 11 mm. longum, 6 mm. latum, margine angusta circa 1 mm. lata in dentes breves obtusas et bracteas 2 terminales 3 cm. longas producta. *Flores* masculi 3-andri, perianthio 3-lobo; flores fœminei centrales, stylo bifido ex ore tubi brevis perianthii exserto.

Hab. West Tropical Africa. Lat. 1° N., *G. Mann*, 1862! Herb. Kew.

Near *D. Tayloriana*, from which it differs in the long slender persistent stipules and weakly toothed margin of the receptacle.

Dorstenia prorepens Engl. in Engl. Bot. Jahrb. xx. 144. Var. robustior, var. nov. Planta magis robusta, foliis 6–10 cm. longis, 2·5–4 cm. latis, supra ad apicem breviter acuminatum et infra ad basin cuneatam angustatis, nervis lateralibus utrinque 4–5, petiolis 1·2–2·5 cm. longis; fructu spheroidale, 2·5 mm. diametro; endocarpium læve.

Hab. South Nigeria. Oban, *Talbot*, 2316! Herb. Mus. Brit.

Dorstenia paucidentata, sp. nov. *Herba* 1–2-pedalis, caule glabra, internodiis superioribus 1·5–2·5 cm. longis, 1·25–2 mm.

crassis. *Folia* membranacea, elliptica, apice breviter acuminata, basi cuneata, obtusa, 10–20 cm. longa, 4–7·5 cm. lata, glabra, in sicco in facie superiore atro-viridia subtus pallidiora; nervis lateralibus utrinque 11–13, subascendentibus, superne arcuatis et infra marginem conjunctis, in facie superiore impressis, subtus prominulis; petiolus subtenuis, 1·2–1·5 cm. longus. *Stipulæ* subulatæ, 2 lin. longæ, caducæ. *Pedunculi* in axillis superioribus solitarii, glabri, tenues, petiolum æquantes vel breviores; receptaculum latissime et breviter obconicum, disco elliptico, 8 mm. longo, 4 mm. lato, margine angusta dentibus 4 late triangularibus carnosulis circa 2 mm. longis et 4 brevioribus obtusissimis vix 1 mm. longis instructa. *Flores* masculi 3-andri; flores fœminei pauci, styli ramuli exserti partem indivisam æquantes.

Hab. West Tropical Africa. Lat. 1° N., Sierra del Crystal, *G. Mann*, 1692! Herb. Kew.

DORSTENIA PSILURUS Welw. in Trans. Linn. Soc. xvii. 71. Var. BREVICAUDATA, var. nov. Planta foliis ut in specie basi cuneatis et margine grosse dentatis, sed receptaculo minore et longitudine 2·5 cm. haud superante; bractea basali vix 2 mm. et apicali vix 4·5 cm. excedente; pedunculo 8–10 mm. longo.

Hab. Uganda. Unyoro, Budongo Forest, 3000 ft., *Bagshawe*, 931! Herb. Mus. Brit.

Dorstenia Talbotii, sp. nov. Planta caule herbaceo parte juvenili veluti petiolis hirsuta pilis albido-brunneis. *Folia* elliptica vel obovato-elliptica, breviter acuminata, infra ad basin obtusam subcordatam angustata, margine integra, circa 1 dm. longa, 4·5 cm. lata, glabra, venis in facie inferiore prominentibus sparse pilosellis exceptis: nervis lateralibus utrinque 7–8, sursum arcuatis et infra marginem conjunctis; petiolus 4–7 mm. longus. *Stipulæ* lineari-acuminatæ, usque ad 4 mm. longæ, subpersistentes. *Pedunculi* in axillis superioribus solitarii, tenues, pubescentes, petiolos valde superantes, 2·5 cm. longi; receptaculum suborbiculare, convexum, circa 8 mm. diametro, margine membranacea vix 2 mm. lata, bracteis circa 10 linearibus patentibus subæqualibus usque ad 1·3 cm. longis, dentibus triangularibus vel processubus brevissimis linearibus interspersis instructa. *Flores* masculi 3-andri, perianthio 3-lobo; flores fœminei per partem centralem sparsi, stylo bilobo exserto.

Hab. South Nigeria. Oban, *Talbot*, 2314! Herb. Mus. Brit.

A member of the *D. Barteri* group of species, in which it is distinguished by its narrow margined receptacle with numerous rather short subequal arms.

Dorstenia Batesii, sp. nov. *Herba* caule erecto, hirtello, internodiis inferioribus 4 cm. longis, 3 mm. crassis, superne brevioribus, 12–8 mm. longis. *Folia* obovata oblongo-elliptica, apice breviter et abrupte acuminato, basi cuneata, obtusa, margine obsolete crenata vel leviter undulata, 8–16 cm. longa, 4·5–6 cm. lata, supra glabra et atrato-viridia, subtus pallidiora et in vicinitate nervorum sparse pubescentia, nervis lateralibus utrinque 10–12, ascendentibus demum arcuatis et infra marginem conjunctis, subtus subprominulis; petiolus crassus, hirtellus, 2·3–1·4 cm.

longus. *Stipulæ* minutæ, breviter et anguste triangulares, 1·5 mm. longæ. *Pedunculi* pauci, in axillis superioribus solitarii, crassi, puberuli, petiolos æquantes; receptaculum planum, orbiculare, disco 2 cm. diametro, margine angusta circa 1 mm. lata bracteis multis valde inæqualibus linearibus apice obtusis vel bilobulatis instructa, quorum 10 2–4 cm. long., intermediis brevioribus interdum dentiformibus. *Flores* masculi 3-andri, perianthio 3-lobo; flores fœminei sparsæ, stylo bifido exserto.

Hab. Cameroons. Batanga, *Bates*, 386! Herb. Kew; Herb. Mus. Brit.

Near *D. Lujæ* De Wildem., but distinguished by the proportionately longer narrower leaves with obtuse base and the receptacle with many bracts exceeding its diameter in length.

Dorstenia Buchananii Engl. in Engl. Bot. Jahrb. xx. 142. Var. longepedunculata, var. nov. Planta ut apparet quam specie minor, circa 15 dm. alta, pedunculis 5 cm. longis vel etiam longioribus, receptaculo circa 13 mm. longo, bractea superiore 5–7·5 cm. longa, inferiore circa 2·5 cm. longa.

Hab. Portuguese East Africa. Near Lake Nyasa, *Johnson*, 494! Herb. Kew.

Dorstenia crispa Engl. Mon. Morac. Afric. 27. Var. lancifolia, var. nov. A typo differt foliis anguste lanceolatis vel oblanceolatis ad basin acutam angustatis, et apice acuto, 5·5–6·5 cm. longis, 1–1·3 cm. latis.

Hab. British East Africa. Ngomeni, dry rocks, *Scott Elliot*, 6279! Herb. Kew, Herb. Mus. Brit.

NOTES ON THE NOMENCLATURE OF FUNGI.—I.

By J. Ramsbottom, M.A., F.L.S.

In this series of notes it is proposed to consider points in nomenclature which arise in connection with the treatment of specimens in the National Herbarium. The general rules of nomenclature are the same for fungi as for phanerogams, but the starting place adopted by the International Congress of Botanists is different. I am strongly of the opinion that it would have been wise to have commenced all botanical nomenclature with the binomial system as introduced by Linnæus in his *Species Plantarum*, rather than that the idea of *dates* should be given such prominence.* The International Rules of Botanical Nomenclature, as far as they relate specially to fungi, are as follows:—

"Art. 19. Botanical nomenclature begins for . . . .

e. Fungi: Uredinales, Ustilaginales and Gasteromycetes, 1801 (Persoon, *Synopsis methodica Fungorum*).

f. Fungi caeteri, 1821–32 (Fries, *Systema mycologicum*).

"Art. 49 bis. Among Fungi with a pleomorphic life-cycle the different successive states of the same species (anamorphoses,

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* In this way the difficulty with regard to the accidental binomials occurring in works which, though appearing after 1753, retain pre-Linnaean nomenclature would not have to be considered.

status) can bear only one generic and specific name (binomial) that is the earliest which has been given, starting from Fries, *Systema*, or Persoon, *Synopsis*, to the state containing the form which it has been agreed to call the perfect form, provided that the name is otherwise in conformity with the rules. The perfect state is that which ends in the ascus stage in the Ascomycetes, in the basidium in the Basidiomycetes, in the teleutospore or its equivalent in the Uredinales, and in the spore in the Ustilaginales. Generic and specific names given to other states have only a temporary value. They cannot replace a generic name already existing and applying to one or more species, any one of which contains the 'perfect' form. The nomenclature of Fungi which have not a pleomorphic life-cycle follows the ordinary rules."

From the above it will be seen that nomenclature in fungi offers peculiar difficulties. In the first place there is the fact that although binomials flourished after 1753, no name can be adopted which appeared before 1801, and in some cases not until 1832. Fortunately the influence of Fries was so great and of such duration that the names he used, in the Basidiomycetes especially, have been generally adopted. The second difficulty arises from the fact that if a name has been given to the so-called "perfect" stage, that name must take precedence.

Syzygites *v.* Sporodinia.

One of the commonest of Mucorineæ, appearing almost inevitably on decaying agarics, is the fungus which is perhaps most often known as *Sporodinia grandis*, though, as will appear later, it has received more than its share of names. Much literature has accumulated around this species, especially during the last few years, because of the frequent occurrence of zygospores. As the fungus is homothallic these sexually produced structures are obtained without difficulty, and hence a great amount of work has been done on the influence of external conditions on their production, and also on the cylotogical phenomena obtaining.

The fungus can be identified from the old descriptions because of the dichotomous branching of its sporangiophores and of its occurrence on decaying agarics.

The first binomial of the fungus appears in Scopoli's *Flora Carniolica*, ed. ii. p. 494 (1772), where the sporangial condition is described under the names *Mucor Aspergillus* and *Mucor capitulis aqueis ; stipite dichotomo, setaceo, procero*, p. 68 of the first edition (1760) is given as a synomym; *Aspergillus ramosissimus in globulos terminatus* of Haller's *Historia Helvetiæ*, iii. p. 114 (1768) is mentioned as probably the same species, though no habitat is given.

Bulliard next described and figured the fungus (*Histoire des plantes vénéneuses*, 116, t. 480, fig 3 (1791)) under the name *Mucor ramosus*. His description and drawings clearly show that he was dealing with the fungus here under discussion.

Persoon was apparently much misled by the different appearances of the sporangial state. One state he described as "*Mucor flavidus* lutescens demum griseus" in Römer's Neues Mag. Bot. i.

p. 94 (1794), and he retained this name in his various publications about that date. In his *Observationes Mycologicæ* (1796) he gives a figure (t. vi. fig. 5) which clearly indicates the species with which he was dealing. In his *Synopsis* (1801) p. 199, he has a section of the genus *Mucor*, "Stipite racemoso," which includes three species, *M. flavidus*, *M. rufus* and *M. Aspergillus*, all of which occur on decaying fungi. *M. rufus* has Bulliard's *M. ramosus* given as a synonym, both the description and figure being quoted; *M. Aspergillus* has a figure of Schrank quoted (Sammlung naturhistor. und physical. Aufsätze, Nürnberg, p. 113, t. 1 (1796) quoted; this I have not seen); *M. flavidus* is regarded as being represented by t. 52, fig. 2, in Schmidel's Ic. pl. Manip. (1793), where it appears under the name "Byssus, stipite ramoso-racemato." The slight differences mentioned in the diagnoses—*e.g.* the ultimate colour and shape of the sporangium—are of no specific importance.

Persoon appears to have given still another name to the fungus in his *Mycologia Europaea*, p. 30 (1822), where he describes it as *Monilia spongiosa*, with no reference to the previous names. The description is not very clear, but the habitat is decaying fungi (also see below). Link meanwhile had added two synonyms, *Aspergillus globosus* (Observ. in ord. plant. i. p. 16, fig. 15, 1809), and *Aspergillus maximus* in Ehrenberg's *Sylvæ*, p. 24 (1818). In 1824, *Species Plantarum* (Willdenow) vi. 1, p. 94, he founded the genus *Sporodinia* for the sporangial stage of this fungus and another species, *S. carnea*, which was afterwards placed in *Botrytis* by Fries. The generic description reads: Hyphasma effusum. Flocci sporangiferi erecti. Sporangium peridio collapso sporas sustinens. He gives *A. globosus* as a synonym, and also *Monilia spongiosa* Pers. "sec. specimen siccum." On p. 66 of the same work Link has a further name, *Aspergillus laneus*,* which is presumably the same species as *A. laneus* of his *Observationes*, p. 16. It will be remarked that all these names have to deal with the non-sexual stage. The "perfect" stage was discovered by Ehrenberg in 1820, and named *Syzygites megalocarpus* (Syzygites, eine neue Schimmelgattung. Verhandl. Gesell. Naturforsch. Freunde, Berlin (1820), p. 98). The well-known copulative series are figured; the case is of historical interest, in that it was the first in which a sexual process was discovered. "Es existiren bey vielen, vielleicht bey allen niedern Formen den geschlechtlichen wenigstens analoge Acte," a statement which has since been fully justified. Ehrenberg found his plant growing together with *Aspergillus maximus* Link on *Agaricus aurantius*, concerning the relation of which he says: "*Aspergillus maximus* Lk. nähert sich in jeder. Beziehung." Streaming of protoplasm was noted, but the oil drops in the zygospore were mistaken for spores, in which error he was followed by Corda and other mycologists till the time of Tulasne. The method of sexual reproduction was compared with that of the

* Link afterwards stated this to be *Syzygites megalocarpus* Ehrenb., but the description does not appear to bear this out. See also Fr. Syst. Mycol. iii. p. 387.

Conjugatæ, which it resembles so much that Léveillé in his classification of fungi, 1846 (D'Orbigny, *Dictionnaire universel d'Histoire naturelle*) though placing the fungus after the Mucorineæ, &c., in the Cystosporés adds "Syzygites, an Alga ærea?"

The diagnosis of the genus as given by Ehrenberg reads: "Fibræ septis nullis, ramosæ aut simplices, cystophoræ, cystes laterales binæ in unam connascentes; fibrarum maturarum apices in fila supera abeuntes." With regard to the species he adds: "Als Synonym führe ich auf Veranlassung des Herrn Prof. Link den Aspergillus laneus desselben an."

For many years it was not realised that the sexual stage and the sporangial stage were states of the same fungus. Consequently they were treated separately in fungus books, though it was often realised that they were closely allied, as *e. g.* in Link (Sp. Plant. p. 94), where *Syzygites* immediately follows *Sporodinia*.

But all these names antedate Fries *Systema* iii, in which the Phycomycetes are treated. However, Fries adopts Ehrenberg's name for the sexual state—*Systema* iii, p. 329 (1832). *Mucor Aspergillus* Alb. et Schwein. Consp. p. 110 (1805) "et forte Aliorum" is given as a synonym. The next genus in the *Systema*, *Azygites*, is one attributed to "Moug. et Fries" in the appendix to Fries Syst. Orb. Veg. i. p. 364. Concerning this Fries states (Syst. Mycol. iii. p. 330): "Char. Flocci tubulosi, continui, erecti, ramosi, peridiolis lateralibus pedicellatis solitariis, globulo sporidiorum conglobatorum medio opaco. Obs. Genus præcedenti simillimum, ut nudis oculis vix distinguas. Historia omnino eadem videtur, sed eximie differt peridiolis pedicellatis, solitariis globulum seminalem includentibus nec in duorum oppositorum confluxu natis." One species is given, *A. Mougeotii*. From this description it looks as if Fries was describing the azygosporic condition of *Syzygites*. Link's *Sporodinia grandis* is given under the name *Aspergillus maximus* p. 387: as synonyms are stated *Aspergillus ramosissimus* Hall., *Mucor Aspergillus* Scop. "et aliorum recent. Auctorum, sed a Syzygite haud distinguentium, quem conferas," and *Monilia spongiosa* Pers. *Mucor ramosus* **rufus* and *M.* **flavidus* are given under *Mucor* p. 318.

Thus the case for *Syzygites* is doubly strong; it is the name of the "perfect" state, and it is adopted in Fries Syst. Mycol. where *Sporodinia* is sunk under *Aspergillus*.

Tulasne (C. R. xli. p. 617, 1855) first clearly stated the relation between the two stages of the fungus:—"A l'égard du *Syzygites megalocarpus* que M. Ehrenberg a su rendre si intéressant, je crois m'être assuré par une analyse attentive que ses fruits naissent de la conjonction de rameaux qui lui sont communs avec l'*Aspergillus maximus* Lk. (*Aspergillus globosus* et *Sporodinia grandis* ejusd.), et, conséquemment, qu'il ne constitue avec ce dernier, son compagnon ordinaire, qu'un seul et même champignon." The relation was proved by the researches of Schacht (1864) and De Bary (1864), though the fungus still continued to suffer from nomenclature frightfulness. The synonomy is as follows:—

SYZYGITES MEGALOCARPUS Fr. Syst. Myc. iii. p. 329 (1832).
Mucor Aspergillus Scop. Fl. Carn., ed. ii. p. 494 (1772).
Mucor ramosus Bull. Plant. Ven., p. 116, t. 480, f. 3 (1791).
Mucor flavidus Pers. in Römer's Neue Mag. Bot. i. p. 94 (1794).
Mucor rufus Pers. Synop. p. 200 (1801).
Aspergillus globosus Link, Magazin Naturforsch. Freunde, Berlin iii. p. 16, f. 15 (1809).
Aspergillus maximus Link in Ehrenb. Sylvæ Myc. Berol. p. 24 (1818).
Syzygites megalocarpus Ehrenb. in Verhandl. Gesell. Naturforsch. Freunde Berlin, p. 98 (1820).
Monilia spongiosa Pers. Mycol. Eur. p. 30 (1822).
Aspergillus laneus Link, Sp. Plant. vi. 1, p. 66 (1824).
Sporodinia grandis Link, Sp. Plant. vi. 1, p. 94 (1824).
? *Azygites Mougeotii* Fr. Syst. Myc. iii. p. 330 (1832).
? *Stilbum nodosum* Corda Icon. i. p. 20, t. v. f. 272 A.
Sporodinia dichotoma Corda Icon. i. p. 22, t. vi. f. 284 (1837).
Nematogonium fumosum Bonord. Allgem. Myk. p. 116, t. ix. fig. 186 (1851).
Nematogonium simplex Bonord. Allgem. Myk. p. 117, t. ix. fig. 187 (1851).
? *Stilbodendrum nodosum* Bonord. Allgem. Myk. p. 118 (1851).
Mucor dichotomus Bref. Untersuch. iv. p. 95, t. vi. fig. 23–25 (1881).
Sporodinia Aspergillus Schröt. Schles. Krypt. fl. iii. 1, p. 209 (1886).
Sporodinia megalocarpus Lind, Danish Fungi, p. 72 (1913).

Fischer in Rabenhorst's Krypt. Fl. iv. p. 225 (1892) quotes "*Mucor Syzygites* de Bary, 1864, Abh. Senckenb, Ges. v. p. 75," as a synonym. (The pagination is that of the separate.) The name used by de Bary is, however, *Syzygites megalocarpus*. Fischer considers *Aspergillus* (*Sporodinia*) *Bellomontii* Mont. Ann. Sci. Nat. 4th ser. xii. p. 181 (1859), and *Sporodinia candida* Wallr. Fl. crypt. germ. ii. p. 317 (1833), to be doubtful synonyms of *Syzygites megalocarpus*.

Fortunately there are so few species in the genus that very little name-changing will be necessary.

TWO NEW ZEXMENIAS.

By S. F. Blake, A.M.

Zexmenia columbiana. Frutex scandens (?). Caulis purpurascens striatus teres tuberculato-strigillosus. Folia opposita oblongo-ovata acuminata basi cuneata vel rotundato-cuneata obscurissime denticulata (dentibus ca. 10–14-jugis minutissimis subremotis) utrinque obscure viridia 3 (sub-5)-nervia (venis subtus subreticulatis prominentibus) supra minute subdense strigillosa subtus ad venas majores tuberculato-strigillosa inter venas glanduloso-adspersa et sparse strigillosa 1–1·3 dm. longa 2·5–3·6 cm. lata, ea ramulorum floridorum multo minora. Petioli

strigillosi supra marginati 6–10 mm. longi. Capitula numerosa ad 8 mm. lata in ramulis axillaribus 2–6·5 cm. longis cymoso-paniculata (ca. 7–20 per ramulum); folia ramulorum 2·5–6 cm. longa; bracteæ ultimæ 3–4 mm. longæ; pedicelli ca. 5 mm. longi. Discus 7–8 mm. altus ad 6 mm. dimetente. Involucri 4-seriati distincte gradati 3 mm. alti (basi bracteis 1–2 oblongis subherbaceis ad 3 mm. longis prædita) squamæ late ovatæ (exteriores) ad ovales firmæ lineatæ induratæ coriaceæ pallidæ glanduloso-adspersæ strigillosæ ciliolatæ apice obtusæ breviter subherbaceæ. Radii 8 flavi oblongi fertiles ad 1·8 mm. longi, stylo valde exserto. Corollæ disci flavidæ in dentibus pubescentes 3·4 mm. longæ. Paleæ obtusæ supra strigillosæ et ciliolatæ 5 mm. longæ. Achenia radii (immatura) trigona trialata in angula interiore arista 2·8 mm. longa in angulis exterioribus squamis duabus ad 0·6 mm. longis et squamellis ca. 2 intermediis prædita; ea disci (immatura) valde compressa anguste alata lineari-cuneata glabra 2·2 mm. longa; aristæ 2 tenues erectæ vel divergentes æquales 3 mm. longæ sursum spinuloso-ciliolatæ basi margine angustissimo 1–2-squamellifero conjunctæ.

COLUMBIA: alt. 244 m., Aguachica, Prov. Ocana, November (1846–52), *L. Schlim* [distr. *Linden* 277] (type in hb. Kew.).—Most nearly related to *Z. mikanioides* (Britton) Blake, Journ. Bot. liii. 200 (1915), but readily distinguished by the smaller heads and different involucre.

Zexmenia leucactis. Frutex ramosus scandens (?). Caulis teres substriatus cinereo-brunneus dense molliter sordido-pilosus infra glabratus; ramuli axillares late patentes. Folia opposita ovata acuminata basi rotundata crenato-serrata (dentibus ca. 27-jugis depressis mucronulatis) 3 (sub-5)-nervia et reticulata supra obscure cinerascentia dense tuberculato-hispida et -hispidula pilis ± incurvis subtus densissime submolliter canescenter pilosula pilis brevibus patentibus basi vix tuberculatis 6–8·5 cm. longa 2·8–4 cm. lata, ea ramulorum minora. Petioli breviter aspero patenti-hispido-pilosi 7–10 mm. longi. Capitula 2·5 cm. lata terminalia et in ramulis axillaribus pauca cymoso-paniculata; pedicelli breviter sordide pilosi 1–3·5 cm. longi monocephali. Discus 8–10 mm. altus 1–1·2 cm. dimetente. Involucri 3-sub-4-seriati ad 8 mm. alti squamæ (intimis exceptis) e basi ovata indurata lanceolatæ herbaceæ acutæ patentes vel reflexæ subæquales dense breviter canescenter hispido-pilosæ, intimæ breviores ovales non appendiculatæ. Radii ca. 8 albi ovales fertiles emarginati in dorso minute puberuli 9 mm. longi 5 mm. lati. Corollæ disci albidæ (?) in dentibus puberulæ 5·5 mm. longæ (tubo 1·6 mm.). Paleæ subacutæ fere glabræ 7 mm. longæ. Achenia (disci) fusco-nigrescentia obovata 4 mm. longa 2·8 mm. lata strigillosa, in alis latis albidis maculatis sparsissime ciliolata; aristæ 2 tenues æquales 3 mm. longæ; squamellæ 4 longiores ad 0·6 mm. longæ et ca. 8 multo breviores, in cupulam connatæ et cum basibus aristarum conjunctæ.

GUATEMALA: Retaluleii, May, 1877, *Bernoulli & Cario* 1396 (type in hb. Kew.).

SHORT NOTES.

A Wandering Lichen.—At the meeting of the Essex Field Club on 28th November, 1914, "Mr. R. Paulson exhibited specimens of the lichen *Parmelia revoluta* var. *concentrica* Cromb., which he called a wandering lichen because it is found on the grass quite unattached to any substratum, and is liable to be moved about by the wind when it blows with any force. This variety of *P. revoluta* was first found by Sir William Trevelyan in the autumn of 1855 on Melbury Hill near Shaftesbury, Devon, and at that time a suggestion was made that certain Parmelias were blown from trees on to the most exposed part of the hill, and that there they continued to grow, though liable to be turned over and blown about by the wind. No recent records of the finding of the plant on Melbury Hill have been made. In 1904 D. J. Scourfield discovered this variety on the downs near Seaford, Sussex, and sent it to friends for the purpose of identification. No attempt appears to have been made at that time to find out more about its peculiar habit. The plant is now fairly abundant on a small area of down country near Seaford. Search has been made this year—1914—by Somerville Hastings and myself of the downs between Eastbourne and Seaford, but we have failed to find it anywhere but at the spot already indicated. The plant readily breaks up in wet weather, so that pieces of all sizes get scattered about on the grass. The larger pieces are mostly more or less spherical in shape. The outer surface is rough owing to the manner in which the extremities of the branches of the thallus are rolled back, thus producing small points. The outside of a sphere is greenish grey, while the inner under surface of the thallus is almost black. The young branches grow over and cover the older ones, so that when cut through the plant exhibits a series of concentric layers. There are no trees less than three quarters of a mile from the Seaford station for this plant, and trees are few and far between on this portion of the downs. On none of the trees in the Seaford area was *Parmelia revoluta* found. After careful search three flints were seen on which the lichen was growing, and there is no doubt whatever that some of the specimens originated on the flints of the chalk. The plants are fixed by the rhizinæ very loosely and easily break off, especially in wet weather. After breaking from the stone the lichen gets constantly blown over and over and gradually assumes the spherical form. There is a point that still needs explanation; it is this: although small portions of the plant are blown about from time to time, the area on which it is found at Seaford is very small. It was the same case with the Melbury plants. The exhibit included some excellent photographic lantern slides by Dr. Somerville Hastings."—*Essex Naturalist*, xviii. 25.

Azolla in the Lea Valley.—Mr. A. W. Graveson having told me that *Azolla* occurred at Dobbs' Weir, on the Lea Navigation near Broxbourne, it seemed desirable to ascertain its range

in this locality, and whether it was continuous with the Enfield site, the nearest named by Mr. A. S. Marsh (Journ. Bot. 1914, p. 211); also what form was present. The following observations were made in November, 1914. Following the canal downward from Rye House the *Azolla* was first noticed about a quarter of a mile above Dobbs' Weir. In the overflow from the canal at the weir it occurs abundantly, and continues in great plenty as far down the canal as Cheshunt Lock. Lower down it occurs more sparingly as far as Enfield Lock, and probably beyond. The whole of the material seems to correspond to the immature state described by Mr. W. H. Burrell (Journ. Bot. 1914, p. 270), being in small pieces, the margins of the leaves, and indeed the whole upper surtace, conspicuously red, and the plant lying close to the surface of the water. Wherever it occurs its abundance or scarcity is in direct relation to that of *Lemna minor*, and wherever the latter fails to get a footing *Azolla* is also absent; while for some miles, where *Azolla* is abundant, it would be difficult to find a patch of *Lemna* of the size of the hand in which *Azolla* was not present. In many mixed patches it may be detected at a distance of fifty yards or more by the prevailing red colour. As to the probable origin of the plant in the canal, several well-known nurserymen have establishments along this part of the Lea Valley, and thus it may easily have been introduced by accident or design. Dobbs' Weir and Enfield Lock are about six miles apart; and as the canal forms the county boundary, the area lies in the vice-counties Herts, Middlesex, and South Essex. —Henry Peirson.

Carex evoluta Hartm. in Britain.—On July 8th I was collecting specimens of *Carex lasiocarpa* Ehrh. (*filiformis* L.) at the eastern end of the peatmoor between Edington and Street, Somerset, v.-c. 6, where it was known to the late Thos. Clark as early as 1855. Growing with it was a larger and stiffer sedge which had the very hairy fruit of *lasiocarpa*, but the more general habit of small *C. riparia*, typical plants of which were growing a hundred yards away if not nearer. I took this to be a hybrid, and sent fresh specimens to the British Museum. The determination has been confirmed from dried material sent to Messrs. A. Bennett, C. E. Salmon, J. W. White, C. Bucknall, and E. S. Marshall. Though not previously seen in Britain, Mr. Bennett says it has been recorded from Sweden, the Russian Baltic provinces, Silesia, Bavaria (? extinct), Saxony, and Transylvania. Mr. Salmon has kindly investigated the synonymy, and tells me that two named forms of the hybrid are known on the Continent, and that my plant seems to be × *C. evoluta* Hartm. (1818) (= *C. filiformis* > *riparia* Rouy (1912); *C. riparia* × *lasiocarpa* Asch. & Graeb. (1898)); and not × *C. pseudo-nutans* Boreau (1885); (= *C. acuminata* Reichb. (1846); *C. spadicea* × *filiformis* Aschers. (1864); *C. filiformis* < *riparia* Rouy (1912)). The latter has leaves 5–7 mm. broad, fruit only 3-3½ mm. long, and glumes as long as or much longer than the fruits.—H. Stuart Thompson.

HELEOCHARIS PALUSTRIS Br. var. ARENARIA Sonder.—In 1911 my friend Mr. A. Wallis sent me from Drigg, Cumberland, one or two specimens that I thought might prove to be the above plant, but the material was not quite sufficient to justify recording it. This season a better supply has come to hand, and there is little doubt that var. *arenaria* is its proper name, which was described by O. W. Sonder (Fl. Hamburg. p. 22, 1851), as follows: "γ. *arenaria*, culmo abbreviato (digitali), spica oblongo-ovata." As the name indicates, the plant occurs on sand dunes, &c. (an unusual habitat for the type); it is small in stature (my examples are 3–8 cm. high), and has a long creeping rootstock (like that of *Carex arenaria*), throwing up at intervals its solitary stems, which are usually curved—a feature noted by Marsson, Fl. Neu-Vorpomm. 511, 1869. The habit and the colour-scheme of the spikes of this variety might lead one at first sight to consider it a small state of *H. uniglumis*, but on closer examination the glume character and sculpture of nut clearly show it must be placed under *H. palustris*.—C. E. SALMON.

ASPERUGO PROCUMBENS IN LINCOLNSHIRE.—An early record for this plant is given incidentally in the *Diary of Abraham de la Pryme* (1671–1704) published by the Surtees Society in 1869. In a letter to Sloane written from Thorne (of which place he was rector) Feb. 2, 1701–2, he says, "I sent you a specimen of *Aparine Plinii*, well pictured and described by Johnston (*sic*) upon Gerrard, but not found by the industrious Mr. Ray or any of our learned botanists, that I have heard of, growing in England. I got it plentifully in a garth of Richard Robinson's. of Broughton in Lincolnshire, amongst the corn." The mistake of Johnston for Johnson is probably that of the transcriber, as Nathaniel Johnston, the Yorkshire antiquary (1637–1705) is frequently referred to in the volume. The description of the plant in Ger. emac. is practically identical with that in Gerard, but the figure given is different.—JAMES BRITTEN.

"COTYLEDON UMBILICUS AS SPINACH."—Under this heading a note (signed "G. S.") is published in Loudon's *Gardeners' Magazine* for 1828, p. 280: as this use of the plant is not, we think, generally known, it may be worth reproducing. "It struck me one day lately, while walking along the lanes here [in Devonshire], the banks of which are covered with *Cotyledon umbilicus*, that the leaves in spring might prove a good vegetable for the table. I accordingly had some boiled, and assure you that it is excellent. In London I am sure it would be considered as a luxury so early in the season as February and March. It requires about twenty minutes to boil. This vegetable has this great recommendation, the total absence of all stringiness. I can, in short, recommend it in the strongest manner; and in the south-west of England it can be procurred wild in any quantity. In consequence of its great succulency, a good quantity of the leaves are required to make a dish; but here a child may gather a sufficient quantity in a few minutes."

Wolffia Michelii.—This duckweed was first noticed by me on June 19th this year in great abundance in a small isolated pond on Ashcott Heath. The plant had been recorded by the Rev. E. S. Marshall in the neighbourhood of Taunton three or four years previously, but until this year had not been noticed in the Bristol district. On July 31st I again found *Wolffia* in a pond near Brent Knoll Station, and a week later came across it for the third time in a rhine between Edington and Shapwick Station, on the North Somerset peat moors. Mr. Cedric Bucknall also discovered it in a pond between Berrow village and Lympsham in July.—Cecil Sandwith.

Scorzonera humilis L.—This interesting plant was first noticed by Noel G. Sandwith on August 20th, 1914, growing in a damp meadow in East Dorset, and was identified by Mr. J. W. White, of Bristol. The plant was apparently growing under perfectly natural conditions amongst other *Compositæ*, and in June this year a large number of plants were noticed flowering in this locality.—Cecil Sandwith.

REVIEW.

Fungoid Diseases of Farm and Garden Crops. Thomas Milburn, with a Prefatory Note by E. A. Bessey. Longmans, Green & Co. 1915. v.–x.+118 pp. 31 text figures. 2*s*. net.

This introduction to the study of plant diseases—a small book of attractive appearance and large print—has been compiled primarily for the use of farmers, gardeners, and agricultural students. There is no doubt that there is need for a book which will give a sound introduction to the study of plant pathology. It cannot be said that we are inundated with English books dealing with plant diseases, and those we have are, on the whole, quite unsatisfactory—in fact, the subject itself is regarded by most people in the way it was regarded at the time of Berkeley. Meanwhile, there is every reason why farmers and gardeners should be given help to understand the ravages to which crops are subjected. The present book is concerned with the principal diseases of crops. The first chapter deals with general information, the remainder with fungoid diseases of cereals, of leguminous plants, of potatoes, of conifers, and of mangels and beet; there is an appendix of five pages treating of fungoid diseases of animals. The fungi are grouped into their classes in each chapter; then under separate headings are given symptoms, cause, and preventive measures. The descriptions under these headings are simple, and appear on the whole sound, although we may doubt whether some of the very abbreviated accounts will be found of much use.

The author does not seem to have always held in mind the circle of readers for whom his book is intended. We are not

talking of the style of the book, which contains clear statements, although it will not arouse the interest of readers; for instance, there is much that is admirable in the introductory chapter, but it seems out of place to have such a schematic arrangement of the vegetable kingdom as displayed on p. 37 and "explained" in adjacent pages, especially as it is an American scheme which is not adopted in this country. Again, chap. ii. begins: "Smuts. Class: Teliosporeæ; Order: Ustilaginales; Family: Ustilaginaceæ.' Apart from Teliosporeæ, which is a name not used in this country, it gives one "some" shock to find such a heading to a chapter in a book of this kind. Another point which calls for attention is the way in which the names of fungi are written. In some cases authorities are given, in others they are omitted. Further, there is very great irregularity in the bestowal of initial capitals to specific names. The statement on p. 79 concerning the oospores of *Phytophthora infestans*—"Pethybridge has shown that they are identical with the oospores formed by *P. erythroseptica*, which causes pink rot of potatoes"—is incorrect.

The figures on the whole are good, though some are rather crude. In spite of its faults the book is one that will appeal to those who are anxious to know the elements of the subject; the preventative measures are also put forth clearly and briefly.

J. Ramsbottom.

BOOK-NOTES, NEWS, &c.

The *Essex Naturalist* (Jan.–June, vol. xviii. parts 1–6) continues to keep up its position as one of the best magazines issued by local societies. Miss Lister calls attention to a plate (t. 96) in Micheli's *Nova Plantarum Genera* (1729), which is dedicated to Samuel Dale, and, with the two preceding it, contains the first good illustrations of Mycetozoa; Miss Lister also contributes a list of the Mycetozoa met with last October during the fungus foray in Epping Forest. Mr. W. Howard describes abnormal flowers of *Ulex europæus*, corresponding closely with those described by Mr. Donald Matheson in this Journal for 1885, p. 157. An interesting note by Mr. Paulson on *Parmelia revoluta* var. *concentrica* is reproduced on p. 308.

It is not only from the daily press that strange things come up to look at us. *The Botanical Journal*, "the official organ of the Royal Botanic Society of London," in its July issue, tells us that, "curiously enough, no scientific description of [*Epigæa repens*] appeared till two years ago." A reference to Linn. Sp. Pl. 395 (1753) will dispel this illusion. The editor of the Journal points out that the Society exists "to carry on systematic botanical research and education," and there is evidently abundant scope for the latter on the Society's own premises.

We regret to record the deaths of Messrs. R. M. Barrington and F. H. Davey, of whom notices will appear in due course.

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LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

THE JOURNAL OF BOTANY was established in 1863 by Dr. Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of general Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

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THE FUNGI OF EAST DORSET.

By the Rev. E. F. Linton, M.A., F.L.S.

Two of the last visits which the late Rev. Wm. R. Linton paid me fell in the autumn months, and he pointed out to me several fungi on these occasions with which he had become familiar in South Derbyshire. His copy of Massee's *British Fungus-Flora* (3 vols. 1893, vol. iv. 1895) came to me by gift after his death, and showed that he had been in the habit of noting in the margin of that work the species he had seen in the neighbourhood of Shirley, where he had lived as vicar of the parish for twenty years in that county.

Consequently I began to collect and record the fungi in my part of the county of Dorset, and as the interest grew, I gradually extended my researches along the eastern borders of the county, from Alderholt and Cranborne, a little to the north, to Branksome Park, near Bournemouth, and Poole Harbour, in the south. From the intervening country within a few miles of Wimborne Minster two ladies aided me by collecting in their respective districts, Mrs. E. W. Baker and Mrs. Pringle, whose names are appended to their records.

As my acquaintance with this branch of botany was very slight, all my specimens, and those contributed by the friends who gave me their assistance, were referred to Mr. J. F. Rayner, F.R.H.S., of Southampton, whose excellent papers on the fungi of the New Forest testify to his thorough knowledge of the fungi of a neighbouring and very prolific district; and to whose courtesy and unfailing readiness to assist I am greatly indebted for the accurate naming of nearly all the species here recorded. A few, chiefly minuter organisms, were identified for me at Kew by the kindness of the Director of the Royal Gardens and some of his staff.

The district, as defined above, is almost entirely on a tertiary formation and light sandy soils preponderate; the chalk occurs in Cranborne and St. Giles, and a strip of heavier soils, the London Clay and the Woolwich and Reading beds, passes through Edmondsham, and divides the sandy district from the chalk.

During the last two seasons Mr. C. B. Green, of Swanage, hearing of my work, offered to collect for me in Purbeck; and, having some previous knowledge of fungi, he soon added a great many locality notes and several species to my list from the east part of South Dorset, including *Septoria euonymi-japonicæ* Passerini, a species which is new to Great Britain. Mr. Green also has submitted to Mr. Rayner all the species he collected with which he was not previously familiar.

Any mycologist wishing for more precise details of localities than those given in this paper may find fuller particulars in the *Proceedings of the Dorset Natural History and Antiquarian Field Club* (vol. xxxv. 1914, and vol. xxxvi. 1915), for which I originally prepared a "Tentative Account of the Fungi of East Dorset," and

in which the actual woods, fields, &c., are mentioned by name, and not merely the parishes.

In regard to the order of classes, families, &c., I have followed Mr. J. F. Rayner in his *Guide to the Fungi and Mycetozoa of the New Forest* (later edition, 1911), in the preface to which he writes that the classification and nomenclature are revised according to the most recently accepted ideas. The order of the species is that of Massee's *British Fungus-Flora* (referred to above), since my notes and memoranda are entered in my copy of that work.

Class I. BASIDIOMYCETES.

Order I. HYMENOMYCETES.

Family 1. AGARICINEÆ Fr.

* *Leucosporæ* (spores more or less white).

Amanita phalloides Fr. Not uncommon; wood north of Corfe Castle, *C. B. Green.* Copses and woods in Edmondsham; Sutton Holms; near Cranborne; Alderholt.—*A. mappa* Fr. Two woods in Edmondsham, and another, Sutton Holms, often referred to in this paper, a mile to the south.—*A. pantherina* Fr. Scarce, poisonous; Castle Hill Wood, near Cranborne; and Birches Copse, near Sutton Holms.—*A. muscaria* Fr. (Latin, "*musca*," a fly, since this species was formerly used for fly-papers). Near Corfe Castle; Scotland Farm; Arne and Encombe Woods, *C B. Green.* Ferndown, *Mrs. Pringle.* Cole Hill, near Wimborne Minster. Sutton Holms.—*A. strobiliformis* Vitt. Rare; Sutton Holms (*W. R. Linton*).—*A. rubescens* Fr. Wood north of Corfe Castle, *C. B. Green.* Mt. Pleasant, Horton. Edmondsham. Broadstone. —*A. spissa* Fr. Local; two woods in Edmondsham. Maldry Wood, St. Giles. Near Alderholt.

Amanitopsis vaginata Roze. Two copses in Edmondsham; and Sutton Holms.

Lepiota procera Fr. "Parasol mushroom"; frequent. About Swanage, plentifully; Ballard and Nine Barrow Downs; near Corfe Castle; Creech Down, *C. B. Green.* Edmondsham Park and Furze Common Copse.—*L. gracilenta* Kromb. Edmondsham. —*L. rachodes* (Vitt.) Fr. Not common. Furze Common Copse, Edmondsham.—*L. holosericea* Fr. Rare; Nine Barrow Down, Swanage, *C. B. Green.*—*L. amianthina* Scop. Infrequent. A copse in Edmondsham. Mt. Pleasant, Horton.

Armillaria mellea Vahl. Edible; common. In a meadow, Studland, *C. B. Green.* Witchampton, *Mrs. E. Baker.* Two woods in Edmondsham. Sutton Holms.—*A. mucida* Schrad. "Beech Disease." Rempstone Wood; Creech Grange, *C. B. Green.* St. Giles Park. Beckington Beeches, St. Giles to Gussage. Edmondsham.

Tricholoma equestre Linn. Rare. Plantation, Alderholt. Pine wood, Broadstone. — *T. portentosum* Fr. Woods and copses, Edmondsham.—*T. acerbum* Bull. Uncommon. Castle Hill Wood, Edmondsham to Cranborne. Maldry Wood, St. Giles.—*T. albobrunneum* Pers. Two woods, Edmondsham.—*T. rutilans* Schaeff.

Pine wood, Corfe Castle, *C. B. Green.* Lower Mannington, *Mrs. Baker.* Alderholt. Cranborne. Copses, Edmondsham. Near Mt. Pleasant.—*T. imbricatum* Fr. Alderholt. Cranborne. Creech Hill Wood, St. Giles.—*T. murinaceum* Bull. Rare; Great Down Copse, Edmondsham. — *T. terreum* Schaeff. Near Swanage; Durlston; Kingston; Quince Hill Wood, *C. B. Green.* Alderholt. Edmondsham. St. Giles Park. Colehill, Wimborne. — Var. *argyraceum.* Plentiful in Durlstone Plantations, *C. B. Green.*—*T. saponaceum* Fr. Castle Hill Wood, Edmondsham. Sutton Holms.—*T. virgatum* Fr. Rare; plantation, Alderholt.—*T. sulphureum* Fr. Witchampton, *Mrs. Baker.* Goatham, and a copse in Edmondsham.—*T. lascivum* Fr. Rare. Furze Common Copse, Edmondsham.—*T. album* Schaeff. Rare. Great Down Copse, Edmondsham.—*T. personatum* Fr. "Blewits." Swanage; Herston; Nine Barrow Down; Corfe Meadows, *C. B. Green.* Furze Common Copse, Edmondsham, *W. R. Linton.*—Var. *sacrum*, a pale-coloured form, near Beckington Beeches, St. Giles.—*T. nudum* Bull. Durlston; Bushey, *C. B. Green.* Crichel; Witchampton, *Mrs. E. W. Baker.* Woods, Edmondsham. Woods, St. Giles.—*T. grammopodium* Bull. Bushey, *C. B. Green.* Copse, Edmondsham. Branksome Park.—*T. sordidum* Fr. Swanage; Durlston; Herston; Langton, *C. B. Green.*—*T. pædidum* Fr. Rare. Peveril Down, and above Swanage quarries, *C. B. Green.*

Clitocybe nebularis Batsch. Nine Barrow Down; down near Chapman's Pool, *C. B. Green.* Witchampton, *Mrs. E. W. Baker.* Cranborne. Edmondsham.—*C. clavipes* Pers. Only seen in Furze Common Copse, Edmondsham.—*C. odora* Bull. Wood south of Alderholt Park. Sutton Holms.—*C. rivulosa* Pers. Uncommon. Downs near Chapman's Pool, an abnormal form, *C. B. Green.* Pasture, Edmondsham.—*C. cerussata* Fr. Not common. Plantation near Cranborne.—*C. phyllophila* Pers. Uncommon; Great Down Copse, Edmondsham.—*C. pithyophylla* Fr. Rare. Furze Common Copse, Edmondsham. — *C. candicans* Pers. Furze Common Copse.— *C. maxima* Gaertn. & Mey. Two copses, Edmondsham. Sutton Holms. — *C. infundibuliformis* Schaeff. Edible. Durlston; Langton; Studland, *C. B. Green.* Plantation near Cranborne.—*C. geotropa* Bull. Two woods, Edmondsham. Maldry Wood, St. Giles.—*C. inversa* Scop. Not common; in two woods, Edmondsham. — *C. flaccida* (Sow.) Fr. Bushey, *C. B. Green.* Furze Common Copse, Edmondsham.—*C. cyathiformis* Bull. Rare. Near Swanage, *C. B. Green.* Maldry Wood, St. Giles.—*C. brumalis* Fr. Not common. Copse near Mt. Pleasant, Horton. Branksome Park.—*C. metachroa* Fr. Not very common. Broadstone. Near Cranborne. Copse, Edmondsham.—*C. ditopoda* Fr. Furze Common Copse. Sutton Holms. —*C. fragrans* (Sow.) Fr. Quince Hill Wood, Langton, *C. B. Green.* Lower Mannington, *Mrs. E. W. Baker.* Maldry Wood, St. Giles. Sutton Holms. Ferndown.

Laccaria laccata Berk. Common. Godlingstone Heath, *C. B. Green.* Ferndown, *Mrs. Pringle.* Plantations, Alderholt, and near Cranborne. Several woods in Edmondsham. Sutton Holms.

—Var. *amethystina* Vaill. Pine wood, Corfe Castle, *C. B. Green.* Witchampton, *Mrs. Baker.* Ferndown. Sutton Holms. Martin Wood.

Collybia radicata Rehl. Edible; not very common. Kingston woodlands, *C. B. Green.* Castle Hill Wood, Edmondsham. Woodland by St. Giles Park.—*C. maculata* A. & S. Durlston; near Scotland Farm; Godlingstone Heath; pine wood north of Corfe Castle, abundant; Creech Heath, *C. B. Green.* Ferndown, *Mrs. Pringle.* Plantation near Alderholt. Copses in Edmondsham and near Mt. Pleasant, Horton.—*C. butyracea* Bull. Nine Barrow Down; Durlston plantations; pine woods at Bushey, and north of Corfe Castle, *C. B. Green.* Rather common in two woods, Edmondsham. Plantation near Cranborne.—*C. velutipes* (Curt.) Fr. Nine Barrow Down, *C. B. Green.* Edmondsham. St. Giles Park. Ferndown.—*C. confluens* Pers. Rare. Furze Common Copse, Edmondsham. Creech Hill, St. Giles.—*C. conigena* Pers. Lower Mannington, *Mrs. E. W. Baker.* Edmondsham. Broadstone. Branksome Park.—*C. cirrhata* (Schum.) Fr. Rare. Two woods, Edmondsham. — *C. tenacella* (Pers.) Fr. Uncommon. Ferndown, *Mrs. Pringle.* Witchampton, *Mrs. Baker.*—*C. dryophila* (Bull.) Fr. Wood, Edmondsham. Near Cranborne. Ferndown. — *C. extuberans* Fr. Rare. Furze Common Copse, Edmondsham.

Mycena capillaris (Schum.) Fr. Rare. Creech Hill Wood, St. Giles.—*M. corticola* (Schum.) Fr. Not common. Edmondsham. Sutton Holms.—*M. discopoda* Lév. Rare. Edmondsham. —*M. rorida* Fr. Rare. Wood in Goatham, Edmondsham.—*M. clavicularis* Fr. Uncommon. Broadstone. — *M. epipterygia* (Scop.) Fr. Rare. Two copses, Edmondsham. St. Giles.—*M. leucogala* Cooke. Ferndown. Copses, Edmondsham. — *M. galopoda* (Pers.) Fr. Not common. Two copses, Edmondsham.—*M. sanguinolenta* Fr. Branksome Park. Sutton Holms. Edmondsham. St. Giles. — *M. Iris* Berk. Rare. Furze Common Copse, Edmondsham. — *M. filopes* (Bull.) Fr. Edmondsham and Goatham. St. Giles Park. — *M. pullata* Berk. & Cke. Rare. Broadstone. — *M. ammoniaca* Fr. Uncommon. Wood, Edmondsham.—*M. metata* Fr. Lower Mannington, *Mrs. Baker.* Copse, Edmondsham, *W. R. Linton.*—*M. consimilis* Cooke. Very rare. Castle Hill Wood, Edmondsham. — *M. stannea* Fr. Goatham. Edmondsham.—*M. rugosa* Fr. Ferndown, *Mrs. Pringle.* Witchampton, *Mrs. E. W. Baker.* Edmondsham. Maldry Wood, St. Giles. — *M. galericulata* (Scop.) Fr. Common. Copses, Edmondsham and Goatham. Cranborne. St. Giles Park. Sutton Holms.—*M. polygramma* (Bull.) Fr. Rare. Two copses on the south borders of Edmondsham.—*M. tintinnabulum* Fr. New Swanage, *C. B. Green.* Plantation, Goatham by Edmondsham.—*M. lactea* (Pers.) Fr. Uncommon. Ferndown, *Mrs. Pringle.* Edmondsham. — *M. luteoalba* Bolton. Rare. In one copse, Edmondsham.—*M. pura* (Pers.) Fr. Witchampton, *Mrs. E. W. Baker.* Edmondsham. St. Giles Park. Near Cranborne.

Omphalia umbellifera (L.) Fr. Sutton Holms?, *W. R. Linton.*

—*O. umbratilis* Fr. Rare. Broadstone. — *O. fibula* (Bull.) Fr. Not common. Wood, Edmondsham. Copse near Sutton Holms.

Pleurotus ulmarius Bull. Rare. Crichel, *Mrs. E. W. Baker.* —*P. ostreatus* (Jacq.) Fr. "Tree oyster." Not common. St. Giles Park.—*P. porrigens* Pers. Rare. Withy Beds, Crichel, *Mrs. E. W. Baker.*

Hygrophorus ceraceus (Wulf.) Fr. Infrequent. Near the Station, Alderholt.—*H. coccineus* (Schæff.) Fr. Swanage; Corfe Castle, *C. B. Green.* Witchampton, *Mrs. Baker.* By Martin Wood, *Miss V. Linton.* Cranborne. Edmondsham and Romford. —*H. miniatus* Fr. Nine Barrow Down; Langton; Corfe Castle, *C. B. Green.* Two woods, Edmondsham, and towards Romford.—*H. puniceus* Fr. Corfe Common, *C. B. Green.* Witchampton, *Mrs. E. W. Baker.* Edmondsham, and its two hamlets, Goatham and Romford.—*H. obrusseus* Fr. Uncommon. Crichel, *Mrs. Baker.* Alderholt.—*H. conicus* Fr. Creech Heath, *C. B. Green.* Frequent in and near Edmondsham.—*H. chlorophanus* Fr. Nine Barrow Down, *C. B. Green.* Crichel, *Mrs. Baker.* Edmondsham. —*H. psittacinus* (Schæff.) Fr. Swanage, *C. B. Green.* Witchampton, *Mrs. Baker.* Fields, Edmondsham and Romford.—*H. pratensis* Fr. Not common. Goatham, Edmondsham.—*H. virgineus* (Wulf.) Cke. Nine Barrow Down; Rempstone Heath, *C. B. Green.* Edmondsham. Sutton Holms. Near Wimborne.—Var. *roseipes* Mass. Near Romford.—*H. cossus* Fr. St. Giles.—*H. hypotheius* Fr. Broadstone. Mt. Pleasant. Alderholt.—*H. niveus* Fr. Local. Downs, north and south of Swanage; Herston; Corfe Common, *C. B. Green.*

Lactarius torminosus (Schæff.) Fr. Edmondsham. Sutton Holms.—*L. turpis* Fr. Infrequent. Ferndown, *Mrs. Pringle.* Copse near Edmondsham.—*L. insulsus* Fr. Rare. Sutton Holms.—*L. blennius* Fr. Edmondsham. Cranborne. St. Giles. —*L. pyrogalus* (Bull.) Fr. Goatham and Sutton Copse, near Edmondsham.—*L. chrysorrheus* Fr. Alderholt. Sutton Holms. —*L. vellereus* Fr. Near Scotland Farm; Langton, *C. B. Green.* Near Romford. Maldry Wood, St. Giles.—*L. deliciosus* Fr. Edible; local. Near Scotland Farm, *C. B. Green.* Sutton Copse, near Edmondsham. Branksome Park.—*L. pallidus* Fr. Martin Wood, *Miss V. Linton.* Edmondsham.—*L. quietus* Fr. Frequent. Lower Mannington, *Mrs. Baker.* Alderholt. Several copses in and near Edmondsham.—*L. theiogalus* Bull. Rare and local. Wood north of Corfe Castle, *C. B. Green.*—*L. rufus* Scop. Poisonous, frequent. Alderholt. Edmondsham. Ferndown. Colehill, Wimborne.—*L. fuliginosus* Fr. Castle Hill Wood, Edmondsham.—*L. volemus* Fr. Rare. Edmondsham.—*L. serifluus* Fr. Bushey and Rempstone, *C. B. Green.* Ferndown, *Mrs. Pringle.* Lower Mannington, *Mrs. Baker.* Several woods in Edmondsham. Sutton Holms. Broadstone. Branksome Park.—*L. mitissimus* Fr. Witchampton, *Mrs. Baker.* Edmondsham. Sutton Holms.—*L. subdulcis* Fr. Romford and Sutton Holms.

Russula Fr. Series A. *Molles* (taste mild).—*R. alutacea* Fr.

Edible; rare. Copse, Edmondsham.—*R. integra* Fr. Uncommon. Sutton Copse, near Edmondsham.—*R. puellaris* Fr. Not common. Edmondsham.—*R. lactea* Fr. Uncommon. Alderholt.—*R. nigricans* Fr. Locally common. Alderholt. Four copses in and near Edmondsham.—*R. adusta* Fr. Alderholt. Edmondsham.—*R. densifolia* Secr. Quince Hill Wood, *C. B. Green.* Edmondsham.—*R. cærulea* Fr. Local. Herston; Studland; Corfe Castle, *C. B. Green.*—*R. heterophylla* Fr. Rare. Sutton Holms.—*R. virescens* Fr. Rare. Birches Copse, near Edmondsham.—*R. furcata* Fr. Edmondsham. Sutton Holms. —*R. vesca* Fr. Edible. Edmondsham, three copses. Sutton Holms. Ferndown.—*R. depallens* Fr. Edmondsham.—*R. cyanoxantha* (Schæff.) Fr. Edmondsham, in three copses.

Russula Fr. Series B. *Tenaces* (taste acrid from the first).—*R. fellea* Fr. Uncommon. Two woods, Edmondsham.—*R. drimeia* Cke. Pine woods, Bushey and north of Corfe; Fitzworth and Godlingston Heaths, *C. B. Green.* Ferndown, *Mrs. Pringle.* Lower Mannington. Colehill, *Mrs. Baker.* Branksome Park. Alderholt.—*R. veternosa* Fr. Rare. Quince Hill Wood, Langton, *C. B. Green.*—*R. ochroleuca* Fr. Alderholt. Two copses, Edmondsham.—*R. fœtens* Fr. Furze Common Copse, Edmondsham, and Birches Copse.—*R. emetica* Fr. Poisonous, like most of this group. Holt Wood, *Mrs. Baker.* Woodland, St. Giles Park.—*R. fragilis* Fr. Edmondsham and Sutton Holms.—Var. *violacea* Ruélet. Witchampton, *Mrs. Baker.* Edmondsham. Ferndown.

Cantharellus cibarius Fr. Birches Copse, and woods in Edmondsham.—*C. aurantiacus* Fr. More common than the last. Nine Barrow Down, *C. B. Green.* Colehill, *Mrs. Baker.* Alderholt. Edmondsham. Broadstone. Branksome Park.—*C. tubæformis* Fr. Alderholt. Edmondsham.—*C. infundibuliformis* Fr. Rare. Branksome Park.

Nyctalis asterophora Fr. Rare. Ferndown, *Mrs. Pringle.*

Marasmius peronatus Fr. Edmondsham. Woodland, St. Giles Park.—*M. oreades* Fr. (Fairy Ring Champignon). Edible; common. Abundant round Swanage; Ballard, Nine Barrow and Creech Down, *C. B. Green.* Edmondsham, in several pastures.—*M. calopus* Fr. Rare. Plantation, Alderholt.—*M. ramealis* Fr. Witchampton, *Mrs. Baker.* Woods, Edmondsham.—*M. androsaceus* Fr. Castle Hill Wood, Edmondsham.—*M. Hudsoni* (Pers.) Fr. Rare. Holt Wood, *Mrs. Baker.*—*M. epiphyllus* Fr. Edmondsham and Goatham, *W. R. Linton.* Woodland, St. Giles Park.

Lentinus cochleatus Fr. Copse, Edmondsham.

Panus stypticus Fr. Witchampton, *Mrs. Baker.* Edmondsham, common. Maldry Wood, St. Giles. Ferndown.

** *Rhodosporæ* (spores pink or salmon).

Lenzites betulina Fr. Birches Copse, south of Edmondsham.

Pluteus cervinus (Schæff.) Fr. Witchampton, *Mrs. Baker.*

Entoloma sinuatum Fr. Maldry Wood or Sutton Copse. Sutton Holms.—*E. lividum* (Bull.) Fr. Edmondsham Rectory

grounds.—*E. prunuloides* Fr. Uncommon. Copse, Edmondsham.—*E. jubatum* Fr. Edmondsham, in two woods.—*E. sericellum* Fr. Rare. Woodland, St. Giles Park.—*E. rhodopolium* Fr. Uncommon. Sutton Holms.—*E. costatum* Fr. Between Romford and Birches Copse.—*E. sericeum* Fr. Local. Downs, north of Swanage; Corfe Common, *C. B. Green.*—*E. nidorosum* Fr. Edmondsham, in two localities.

Clitopilus prunulus (Scop.) Fr. Edible; hardly common. Edmondsham Rectory garden, and in two copses.

Leptonia lampropoda Fr. Furze Common Copse; and Sutton Holms.—*L. solstitialis* Fr. Rare. Broadstone.

Nolanea pascua (Pers.) Fr. Edmondsham and Romford. Horton. Broadstone.

Claudopus variabilis W. G. Smith. Cranborne. Edmondsham and Birches Copse.

*** *Ochrosporæ* (spores of brown tints).

Pholiota ægerita Fr. Rare. On ash, Whitecliffe Farm, Swanage, *C. B. Green.*—*P. squarrosa* (Muell.) Fr. Very local; edible. Near Kingston, *C. B. Green.* Witchampton, *Mrs. Baker.* Edmondsham (once), *W. R. Linton.*—*P. spectabilis* Fr. Ferndown, *Mrs. Pringle.* Near Mount Pleasant, Horton.—*P. marginata* (Batsch.) Fr. Rare, copse in Edmondsham, near Castle Hill.

Inocybe scabra Fr. Plantation near Cranborne. Copse, Edmondsham. St. Giles Park.—*I. lacera* Fr. Rare. Woodland, St. Giles Park.—*I. rimosa* (Bull.) Fr. Infrequent, Edmondsham, sparsely.—*I. geophylla* (Sow.) Fr. Plantations near Alderholt and Cranborne. Here and there in Edmondsham.—*I. scabella* Fr. Local. Edmondsham. St. Giles Park. Sutton Holms.

Hebeloma fastibile Fr. Frequent. Bushey, *C. B. Green.* Cranborne. Edmondsham and Goatham. Maldry Wood, St. Giles.—*H. glutinosum* (Lindg.) Fr. Not common. Dead Man's Corner, Cranborne.—*H. mesophæum* Fr. Branksome Park.—*H. crustuliniforme* (Bull.). Fr. Sutton Holms.

Flammula lupina Fr. Rare. Edmondsham.—*F. carbonaria* Fr. Not common. Broadstone. Branksome Park.—*F. flavida* Schaeff. Edmondsham.—*F. inopoda* Fr. Rare. St. Giles Park.—*F. hybrida* Fr. Very rare; not in the New Forest list. Plantation north of Ferndown.—*F. sapinea* Fr. Branksome Park; Lower Mannington, *Mrs. Baker.* Broadstone.—*F. ochrochlora* Fr. Plantation near Cranborne. Edmondsham.

Naucoria melinoides (Bull.) Fr. Stanridge plantation, Cranborne.—*N. semiorbicularis* (Bull.) Fr. Uncommon. Alderholt. Broadstone. Ferndown.

Galera hypnorum (Batsch.) Fr. Edmondsham. Sutton Holms. Ferndown. Broadstone.—*G. tenera* (Schæff.) Fr. Peveril Down; near Swanage on the north; Corfe Common; Encombe Downs, *C. B. Green.*

Tubaria furfuracea (Pers.) W. G. Smith. Swanage; Durlston, *C. B. Green.* Ferndown, *Mrs. Pringle.* Edmondsham; Goatham and Birches Copse.

Crepidotus mollis Fr. On dead ash, Encombe, *C. B. Green.* On dead apple trunk, Edmondsham.—*C. applanatus* Fr. Edmondsham.—*C. alveolus* Lasch. Rare. Creech Hill, St. Giles, *W. R. Linton.*—*C. epibryus* Fr. Only found in Sutton Holms.

Cortinarius Fr. For convenience, the species are divided into five subgenera:—

1. *Phlegmacium* Fr.—*Cortinarius varius* Fr. Lower Mannington, in pastures, *Mrs. Baker.*

2. *Myxacium* Fr.—*Cortinarius mucifluus* Fr. Not common. Plantation south of Alderholt.—*C. elatior* Fr. Copses in Edmondsham and Birches Copse.

3. *Dermocybe* Fr.—*Cortinarius ochroleucus* Fr. Not common. Ferndown, *Mrs. Pringle.* Woodland, St. Giles Park.—*C. tabularis* Fr. Not common; only seen in Birches Copse, south of Edmondsham.—*C. caninus* Fr. Creech Meadows, *C. B. Green.* Two woods about Edmondsham, and Sutton Holms. Alderholt.—*C. myrtillinus* Fr. Rare. Sutton Holms.—*C. cinnabarinus* Fr. Holt Wood; Lower Mannington; Cole Hill, Wimborne, *Mrs. E. W. Baker.*—*C. cinnamomeus* Fr. Branksome Park. Alderholt.—Var. *semisanguineus* Fr., frequent in both localities, with the type; also at Ferndown.

4. *Telamonia* Fr.—*Cortinarius torvus* Fr. Sutton Holms, and two woods in Edmondsham.—*C. hinnuleus* Fr. Wood north of Corfe Castle, *C. B. Green.* Birches Copse, south of Edmondsham.—*C. brunneus* Fr. Edmondsham. St. Giles Park.—*C. incisus* Fr. St. Giles Park. Broadstone.—*C. hemitrichus* Fr. Castle Hill Wood, Edmondsham. All of this group and the following are rare or very local.

5. *Hygrocybe* Fr.—*Cortinarius armeniacus* Fr. Birches Copse. Not in the New Forest list.—*C. saturninus* Fr. Witchampton, *Mrs. Baker.*—*C. bicolor* Clarke. Castle Hill Wood.—*C. jubarinus* Fr. Lower Mannington, *Mrs. Baker.* Broadstone.—*C. rigens* Fr. Edmondsham.—*C. decipiens* Fr. Woods in Edmondsham. Broadstone.—*C. acutus* Fr. Broadstone. Sutton Holms. St. Giles Park. Alderholt.

Paxillus involutus Fr. Durlston plantations; pine woods, Bushey, and Corfe Castle; Langton, *C. B. Green.* Edmondsham.—*P. panuoides* Fr. Ferndown.

***** *Melanosporæ* (spores black or purplish black).

Agaricus arvensis Schæff. "Horse Mushroom." Ballard, Nine Barrow and Creech Downs; Creech Meadow; on downs west of the lighthouse a spongy cracked form occurs, *C. B. Green.* Field in Edmondsham and towards Romford.—*A. campestris* L. "Common Mushroom." Abundant in the Purbeck district; on the chalk downs often rough and warted, *C. B. Green.* Several fields in Edmondsham and from there to Verwood. No doubt frequent in the district.

Stropharia æruginosa (Curt.) Fr. Nine Barrow Down, *C. B. Green.* Stanridge plantation, near Cranborne. Copse, Edmondsham.—*S. inuncta* Fr. Not common; Edmondsham.—

S. merdaria Fr. Corfe Common; Nine Barrow Down, *C. B. Green.* Edmondsham to Romford.—*S. semiglobata* (Batsch.) Fr. Creech Heath, *C. B. Green.* Fields in Edmondsham and towards Romford. Branksome Park.

Hypholoma sublateritium (Schæff.) Fr. Witchampton, *Mrs. Baker.* Near Mount Pleasant, Horton. Edmondsham. Alderholt.—*H. capnoides* Fr. Lower Mannington, *Mrs. Baker.* Near Mount Pleasant. Copses, Edmondsham and near Alderholt.—*H. epixanthum* Fr. Copse, Edmondsham. North of Ferndown.—*H. fasciculare* (Huds.) Fr. Very common. Swanage; Studland; Durlston; Herston; Rempstone, *C. B. Green.* Ferndown, *Mrs. Pringle.* Witchampton, *Mrs. Baker.* Branksome. Sutton Holms. Edmondsham, frequent in woods, &c. Alderholt. Cranborne.—*H. velutinum* (Pers.) Fr. Not common. Edmondsham.—*H. appendiculatum* (Bull.) Fr. Only seen in Castle Hill Wood.—*H. hydrophilum* (Bull.) Fr. Alderholt. Edmondsham and Goatham. Ferndown.

Psilocybe semilanceata Fr. Edmondsham and Romford. Sutton Holms.—Var. *cærulescens* Cooke. Rhymes Copse, Edmondsham.—*P. spadicea* Fr. Infrequent. Sutton Holms.—*P. fœnisecii* (Pers.) Fr. Copse, Edmondsham and Sutton Holms.—*P. ericæa* (Pers.) Fr. Very local. Studland Heath, *C. B. Green.*

Psathyra corrugis (Pers.) Fr. Local. St. Giles Park.

Bolbitius fragilis Fr. Nine Barrow Down, *C. B. Green.* Edmondsham, once. Stanridge plantation, near Cranborne.

Coprinus atramentarius Fr. Swanage churchyard, *C. B. Green.* Edmondsham, and towards Sutton Holms.—*R. fimetarius* Fr. Studland, *C. B. Green.* Scarce, Edmondsham. Near Creech Hill, St. Giles.—*C. micaceus* Fr. Durlston; Encombe Downs, *C. B. Green.* Crichel, *Mrs. Baker.* Edmondsham.—*C. comatus* (Fl. Dan.) Pers. Ulwell, and two or three other spots near Swanage, *C. B. Green.* Edmondsham; growing out of hard ground on the side of a lane.—*C. deliquescens* Fr. Ulwell; Combe near Swanage, *C. B. Green.* Edmondsham. Creech Hill Wood, St. Giles.—*C. tardus* Karst. Creech Hill Wood (probably this species, *J. F. Rayner*).—*C. radiatus* Fr. Seen once by Mr. Rayner in an Edmondsham wood.—*C. domesticus* Fr.? In garden ground, Swanage, specimen not in good condition, *C. B. Green.*—*C. plicatilis* (Curt.) Fr. Pasture in Edmondsham surrounded by woods.

Panæolus campanulatus (L.) Fr. Woodland by St. Giles Park.—*P. phalænarum* Fr. On dung, Studland, *C. B. Green.*

Psathyrella gracilis (Pers.) Fr. Herston, *C. B. Green.* Alderholt. Edmondsham. Sutton Holms.—*P. atomata* Fr. Rare and local. Rough ground, Swanage, *C. B. Green.* St. Giles Park.—*P. disseminata* (Pers.) Fr. In plenty on a stone wall, Swanage, 1915, *C. B. Green.* Sutton Holms.

Gomphidius glutinosus (Schæff.) Fr. Rare and local, under conifers. Fitzworth Heath, Purbeck, *C. B. Green.*

(To be concluded.)

FOUR NEW HETEROSPERMAS.

By S. F. Blake, A.M.

Heterosperma* **achætum.** Annuum tenellum 1·1–2·6 dm. altum suberectum ramosius. Caulis viridis subquadrangularis bifariam hispido-pilosulus, ramis inferioribus laxis patentibus. Folia opposita figura deltoideo-ovata simpliciter pinnatilobata 8–20 mm. longa 12–23 mm. lata parce hispido-pilosa, lobis 3–5 linearibus crassiusculis mucronatis 3–13 mm. longis 0·5–1 mm. latis, lobis inferioribus interdum lobulis 1–2 lateralibus præditis. Petioli infra ampliati subscariosi hispido-piloso-ciliati 5–11 mm. longi. Capitula pauca (ca. 10–16) pedunculos nudos quadrangulatos sparse hispidulos axillares sæpe oppositos 3·8–5·6 cm. longos terminantia. Discus (anthesi) 3·8 mm. altus 3 mm. crassus (fructu) 4·5–5·3 mm. altus 6–6·5 mm. crassus. Involucri biseriati squamæ exteriores 3–4 herbaceæ lineari-lanceolatæ acutæ mucronatæ apice excepto hispido-ciliatæ 4·5–6 mm. longæ 0·7–1 mm. latæ, basi maturitate paullum induratæ; interiores paullo breviores ca. 6 membranaceæ glabræ ovales obtusæ flavido-brunneæ lineatæ paleas simulantes sed latiores. Radii 3 pallide flavi fertiles ovales profunde bilobati lobis interdum bidenticulatis 1·6 mm. longi 1 mm. lati (tubo 1·3 mm. longo excluso). Corollæ disci aurantiaco-aureæ 2·5 mm. longæ (tubo 1·4 mm.), faucibus campanulatis basi granulari-circumcinctis. Paleæ oblongo-ovales obtusiusculæ flavidæ lineatæ scarioso-membranaceæ 3·5–4·6 mm. longæ ad 1·5 mm. latæ. Achenia radii ovali-obovata glabra valde obcompressa crustaceo-marginata in faciebus 1-nervia nigrescentia apice paullum inflexo-cucullata obtusiuscula calva 3·3 mm. longa 2 mm. lata; ea disci similia oblongiora 4·3 mm. longa 1·2 mm. lata erostrata calva.

Columbia: alt. 2660 m., Bogota, 1851–57, *Triana*, 1397 (type, Brit. Mus.); also *Linden*, 511 (ex hb. Triana), without locality (Brit. Mus.).—The only South American species with truly linear leaf-lobes. Very distinct in its completely calvous achenes, in the granular or glandulose ring at the base of the throat of the orange-yellow disk corollas, in the scarcely appendaged style-branches and scarcely at all sagittate anther-bases.

Heterosperma ovale. Annuum e basi ramosum ramis patulis procumbentibus 1·3–2·8 cm. longis. Rami (vel caules) tenues virides angulati striati bifariam pilosi simplices vel e basi parce ramosi. Internodia 2–4 cm. longa. Folia opposita ovalia vel rhomboideo-ovalia acutiuscula e medio ad basin late cuneata integra supra medium serrato-dentata (dentibus 3–4-jugis depresso-deltoideis mucronatis sparse tuberculato-ciliatis) supra sparse pilosa subtus glaberrima (pilis 2–3 ad venas obvenientibus exceptis) vix pallidiora penninervia (nervis lateralibus ca. 4-jugis) punctulata

* The generic name was originally published by Cavanilles in this form in 1794, and again used by him in 1802 in the same form. Willdenow without due cause changed it in 1804 to *Heterospermum*, in which he has been followed by later authors; but the original form should be retained.

1·2–1·7 cm. longa 9–14 mm. lata in petiolos hispido-piloso-ciliatos anguste marginatos 3–6 mm. longos angustata. Capitula (1–3 per caulem) in pedunculis nudis axillaribus et terminalibus 1·9–3 cm. longis insidentia. Discus (anthesi) 5·5 mm. altus 2·5 mm. crassus (fructu) 8 mm. altus (acheniis inclusis) 6 mm. latus. Involucri biseriati squamæ exteriores 4 herbaceæ anguste oblongo-spathulatæ obtusiusculæ hispido-ciliatæ 5·5 mm. longæ 1·3 mm. latæ; interiores ad 4 membranaceæ late oblongæ exterioribus paullo breviores obtusæ flavidæ lineatæ sparse pilosæ pilis laxis multiloculatis. Radii non visi. Corollæ disci flavæ glabræ 2·5 mm. longæ (tubo 1 mm.). Paleæ oblongæ scarioso-membranaceæ pallidæ lineatæ obtusiusculæ 5·5 mm. longæ 1·4 mm. latæ. Achenia radii oblongo-obovata in marginibus paullulum inflexa valde crustaceo-marginata in faciebus valde 1-nervia nigrescentia apice truncata breviter biaristata 4·5 mm. longa 2 mm. lata, aristis retrorsim spinulosis 0·6 mm. longis; ea intima disci lineari-fusiformia obcompressa striata apice brevirostrata (rostro pallide flavescente) non marginata 5·8 mm. longa, aristis 2 retrorsim spinulosis 1·8 mm. longis; ea intermedia disci similia paullo latiora brevius rostrata ± marginata. Antheræ basi parum sagittatæ. Styli rami sursum parum papilloso-hirtelli appendice lineari-lanceolata papilloso-hirtella prædíti.

Santo Domingo: near Maniel de Ocua, mountain slopes, alt. 300 m., October, 1910, *Türckheim*, 3639 (type, Brit. Mus.).—Distributed as *H. diversifolium* H. B. K., a South American species, differing widely in habit and leaf form.

Heterosperma spathulatum. Annuum erectum ramosius ad 1·3 dm. altum, ramis horizontalibus vel adscendentibus caule multo longioribus (usque ad 2·6 dm. longis). Caulis subquadrangulatus striatus tenuis bifariam pilosus. Folia glabra opposita inferiora figura deltoidea 8–12 mm. longa 8–16 mm. lata pæne ad costam trilobata lobis spathulato-obovatis sursum pectinato-serratis (dentibus ca. 3-5-jugis mucronulatis), superiora non lobata spathulato-obovata pectinate dentata; petioli æquilongi hispido-piloso-ciliati basi paullum ampliati subscariosi angustissime marginati. Capitula numerosa axillaria et terminalia in pedunculis nudis striatis sparse hispidulis 2–4·5 cm. longis. Discus (anthesi) 5 mm. altus 4 mm. crassus (fructu) 6·5–7 mm. altus 7–10 mm. crassus. Involucri biseriati squamæ exteriores 4 herbaceæ anguste oblongæ obtusiusculæ 3-nerviæ sparse ciliatæ 4 mm. longæ 1 mm. latæ; interiores ca. 5 membranaceæ oblongæ glabræ flavidæ lineatæ obtusiusculæ 5 mm. longæ 2·2 mm. latæ. Radii 5 oblongo-ovales apice bilobati (lobis integris vel bidentatis) flavi glabri, lamina 2·2 mm. longa 1·1 mm. lata tubum paullo superante. Corollæ disci flavæ glabræ 2·6 mm. longæ (tubo 1·5 mm. longo in fauces campanulato-infundibuliformes subsensim ampliato ad basin contracto). Paleæ oblongæ acutiusculæ flavescentes glabræ lineatæ scarioso-membranaceæ 5 mm. longæ 1·4 mm. latæ. Achenia radii late obovata utrinque truncata valde crustaceo-marginata in facie interiore 1-nervia (costa maturitate crustaceo-incrassata) 3·6–5 mm. longa 3·5 mm. lata calva; ea disci similia longiora 5·5 mm. longa

2·1 mm. lata non rostrata biaristata, aristis 2 retrorsim spinulosis 1·6 mm. longis.

Ecuador: sandy fields, Riobamba, November, 1858, *Spruce*, 5788 (types, Brit. Mus., Kew).—Distributed as *H. diversifolium* H. B. K., which has different leaves and a strongly hispid-pilose involucre.

Heterosperma trilobum. Annuum tenue basi simpliciter vel subsimpliciter ramosum, ramis procumbentibus vel adscendentibus 6–12 cm. longis caule multo longioribus. Caulis ramique quadrangulares virides striati bifariam hispido-pilosi. Internodia 1·1–2·4 cm. longa. Folia opposita deltoideo-ovata vel infima depresso-orbicularia obtusiuscula mucronata basi late cuneata vel rotundata profunde trilobata, lobis lateralibus minoribus obovatis vel obovato-spathulatis integris vel 1-denticulatis mucronatis, lobo medio late cuneato vel cuneato-ovali ad apicem tridentato vel leviter trilobato, supra viridia sparse pilosa pilis multiloculatis subtus vix pallidiora ad venas sparsissime pilosa 8–20 mm. longa 1–1·4 cm. lata. Petioli anguste marginati hispido-piloso-ciliati 3–6 mm. longi. Capitula pauca in pedunculis nudis ramos terminantibus quadrangulatis sparsissime hispidulis 1·2–3·2 cm. longis. Discus (anthesi) 5 mm. altus 4 mm. crassus (fructu) 8 mm. altus (acheniis inclusis) 6–9 mm. crassus. Involucri biseriati squamæ exteriores 3–4 herbaceæ subspathulato-oblongæ ad 4·5 mm. longæ 0·8 mm. latæ obtusiusculæ hispido-piloso-ciliatæ pilis longis multiloculatis; interiores membranaceæ late oblongæ lineatæ flavidæ obtusiusculæ subsparse pilosæ pilis laxis multiloculatis exteriores subæquantes. Radii ca. 3 fertiles flavi late ovales, lamina 1·3 mm. longa 1·3 mm. lata. Corollæ disci flavæ glabræ 2·2 mm. longæ (tubo 1 mm.), faucibus campanulato-infundibuliformibus. Paleæ oblongæ obtusæ squamis interioribus similes 5·5 mm. longæ 1·4 mm. latæ. Achenia radii late oblonga apice truncata nigra flavescenti-crustaceo-marginata et subalata in facie interiore 1-nervia biaristata 4 mm. longa ad 2·2 mm. lata, aristis retrorsim spinulosis 1·2 mm. longis; ea disci similia obovato-cuneata calloso-marginata brevissime rostrata biaristata 5 mm. longa 1·5 mm. lata, aristis retrorsim spinulosis 2·2 mm. longis.

Santo Domingo: sandy places on shore of a river, near Maniel de Ocoa, October, 1910, *Türckheim*, 3640 (type, Brit. Mus.).—Distributed as *H. diversifolium* H. B. K. variety, but scarcely to be compared with that species. The leaves of *H. trilobum* are very different in outline and dimensions, and are almost never subentire as are the upper ones in that species. A single plant of *H. trilobum* shows a few pairs of rhombic-ovate merely serrate uppermost leaves on different branches. The present species is much more closely related to *H. ovale* described above, of which it may prove to be a variety, but as the type-specimens of each give no sign of intergradation, it seems best at present to consider the two specifically distinct. *H. trilobum* and *H. spathulatum* agree with *H. ovale* in details of stamens and style-branches.

NOTES ON STATICE.*

By C. E. Salmon, F.L.S.

XII.—Statice acutifolia Reichb.

In Reichenbach's account of *Statice minuta* L. (Ic. crit. ii. 78, 1824) he figures plants gathered both in Corsica and Southern France (t. 186, figs. 324, 325). His description and fig. 325 doubtless refer to true *S. minuta* L. mentioned in Journ. Bot. 1915, p. 241; fig. 324 must now be considered. The plant drawn came from "Bonifacio in maritimis in insula Corsica, cl. Salzmann," and, although the figure does not well represent the species occurring there, I think it is clear it cannot be grouped under the forms of *S. minuta* in my last contribution to this Journal.

In the next volume of Reichenbach's Ic. crit. (iii. 23, 1825) the following appears:—"374. *Statice acutifolia*: Scapo tereti, ramis erecto-patulis dichotomo-fastigiatis, floribus distantibus elongatis, foliis anguste lanceolatis acutis. Rchb. Syn. *St. minuta*. Moretti in litt. Hist. 359 [374] 'Genova' cl. Moretti." A note follows pointing out how the new species differs from *S. minuta*, more particularly in its elongated flowers and narrower acute leaves.

It appears, however, that there was some error as regards the origin of the plant described, and that Moretti never found the specimen at Genoa; thus Bertoloni (Fl. Ital. iii. 521, 1837) writes:—"Hæc nullimode provenit in Liguria, ut habet Reichenbachius, *l. c.* Hactenus tantum reperta in Sardinia, et primo quidem a Badaroo."

In 1831 Reichenbach (Fl. germ. excurs. i. 191) published his *S. rupicola*, with the following description:—"*St. rupicola* Badarr. foliis lineari-lanceolatis acutis, scapo tereti, ramis arrecto-patulis dichotomo-fastigiatis, floribus distantibus elongatis. *St. acutifolia* Rchb. pl. crit. iii. Ic. 374. Differt multis notis a *St. minuta* quam cf. Ic. 324, 325, Riviera di Genova: Moretti." It will be noted that he cites his own *S. acutifolia* as a synonym, and that the error as regards locality is repeated.

In 1855 H. G. Reichenbach, the younger (Ic. germ. xvii. 64), reinstates the *S. acutifolia* of his father's Ic. crit. with the following description:—"*S. acutifolia* Rchb. Icon. iii. ccxxv. fig. 374: Valda cæspitosa, foliis cuneato lanceolatis acutis obtusisve, numquam emarginatis; calycis tubo glabro. *St. rupicola* Badar. Rchb. Exc. 191. *St. tenuifolia* Bert. in Colla Herb. Ped. iv. 551. Occurrit duplex varietas—altera cæspites densis—simos quasi Galiaceos efformat paniculasque minutissimas profert; altera minus cæspitosa paniculas longiores gerit, semper tamen basin usque floridas. Rivièra di Geneva Moretti! (Bonifacio Corsicæ: Eschenbach! Salzmann! Kralik 748!). Icon. nostr. Tab. 93, MCXLIV. I. Caulis variètatis cæspitosæ. 1. Spicula. +."

The points to be observed are the altered description of the

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* See Journ. Bot. 1903, 65; 1904, 361; 1905, 5, 54; 1907, 24, 428; 1908, 1; 1909, 285; 1911, 73; 1913, 92; 1915, 237.

leaves, and, while the old error of the Genoese locality still finds a place, some Corsican collectors and an exsiccata are mentioned.

A careful examination of the works of the above mentioned authors, and the study of authentic material where possible, led me to the following conclusions:—(1) That the Sardinian and Corsican plants have certain peculiarities that seem to keep them distinct, and that both may be conveniently separated from *S. minuta*. (2) That Reichenbach's f. 324, included under his *S. minuta* in Ic. crit. ii. 78, represents the Corsican plant now under discussion. (3) That Reichenbach (Ic. crit. iii. 23) describes and figures the Sardinian plant as *S. acutifolia*, which he renames *S. rupicola* Bad. in his Fl. germ. excurs. 191. (4) That the *S. acutifolia* * of Reichb. fil. (Ic. germ. xvii. 64, t. 1144, f. i.) is the Corsican plant, and therefore not synonymous with his father's plant of the same name (Ic. crit. iii. 23), which is the Sardinian form.

The Sardinian plant has also received the name *S. tenuifolia*, and the original description may be found in Moris, Stirp, Sard. Elench. fasc. ii. 8, 1827–29:—"*S. tenuifolia* Bertol. in lit. S. caule basi suffruticoso ramoso-dichotomo folioso, foliis imbricatis glaucis asperis rigidis linearibus obtusis, apice mucronulatis. Habitat in aridis saxosis maritimis, S. Catterina-pittinuri: flores hactenus non vidi." Moris, later (Fl. Sardoa. iii. 43, 1858–59), reduces this to a synonym of *S. rupicola* Bad., identifies it with the *acutifolia* of Reichb. Ic. crit. iii. 23, t. 374, and gives an excellent detailed description of the plant.

A good deal of confusion has been caused by various authors using the name *S. rupicola* Bad. to designate either the Corsican plant alone, or that and the Sardinian form collectively. Thus Grenier and Godron (Fl. Fr. ii. 746, 1850) use this name for the Corsican plant, and mention, as a synonym, "*S. tenuifolia* Moris! elench. fasc. 2, p. 8 (forma foliis angustis acutis").

It will be gathered from the foregoing remarks that one of the distinguishing features of the Sardinian plant is its narrow acute leaves. In Herb. Boissier may be found plants from Sardinia with leaves almost as broad as those upon typical Corsican examples, but the apex is invariably much more acute and the margin not revolute. It seems reasonable to suppose that, just as the Corsican plant may vary from the stunted narrower-leaved dwarf-scaped state (the "var. *depressa*" of Reverchon exsicc. no. 378) to the luxuriant broader-leaved ample-scaped form (Reverchon exsicc. nos. 376, 379), so the Sardinian race may present such states as the linear-lanceolate, practically setaceous, leaved form (Fl. Ital. exsicc. no. 1102) and the plants in Herb. Boissier referred to above.

From *S. minuta* L. and its varieties, the Sardinian plant may be separated (besides bract and calyx characters) by its acutely pointed, narrow, non-revolute-margined leaves, cæspitose habit, and strictly erect branches of the scape.

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* Named *S. rupicola* Bad. on the plate.

The Corsican plant may usually be distinguished at a glance by its remarkably elongated divisions of the root-stock, provided with numerous not very closely imbricated leaves, which have a much more elongated outline than those of *minuta* and an apex never rounded or retuse, but pointed; their margins, too, never seem so strcngly revolute when dry, nor is the channel so marked, as in *minuta*. There are also the bract and calyx characters to rely upon, and well-grown examples of the plant show scapes more branched than in *minuta*, with the branches often more divaricate.

The synonymy, description, and distribution of the two plants may be arranged as follows :—

STATICE ACUTIFOLIA Reichb. Ic. crit. iii. 23 (1825), excl. syn. et hist.; non Reichb. fil. Ic. germ.; Bertol. Fl. Ital. iii. 520 (1837); Barbey, Fl. Sard. comp. 231 (1885).

S. tenuifolia Bertol.! ex Moris, Stirp. Sard. el. fasc. ii. 8 (1827–1829); Colla, Herb. Ped. iv. 551 (1835).

S. rupicola Badarr.! ex Reichb. Fl. germ. excurs. i. 191 (1831), excl. loc.; Moris, Fl. Sard. iii. 43 (1858–59); Barbey, Fl. Sard. comp. 44 (1885).

Icon.—Reichb. Icon. Crit. iii. t. 225, f. 374!

Exsicc.—Fiori et Béguinot, fl. ital. exsicc. 1102!

Radix lignosa supra in confertas non elongatas partes crebro partita; planta nana, glabra, parum scabrida; folia parva, perspicue acuta, setacea aut lineari-lanceolata (raro lineari-obovata), dense imbricata, crassa, non rugosa nec margine revoluta. Scapus 3–8 cm. altus, erectus, juxta basin ramosus; rami omnes erecti; rami inferiores steriles pauci. Spicæ erectæ, paucifloræ dissitifloræ; bractea media quam exterior vix sesquilongior; bractea interior quam exterior ± 2·5 plo longior; calyx circa 5 mm. longus, fere glaber aut in dimidio inferiore parce hirsutus, tubus circa 3 mm. longus; corolla diam. circa 6 mm., violacea.

Root perennial, woody, divided at the crown into numerous not elongating divisions, forming a ± dense cushion. *Plant* dwarf, glabrous, slightly scabrid. *Leaves* small, acute or acuminate, setaceous or linear-lanceolate (rarely linear-obovate), densely imbricate, thick, not rugose nor with margins revolute. *Scape* short, 3–8 cm. high, branched from near base, erect. *Branches* all erect; sterile lower branches few. *Spikes* erect, few- and lax-flowered. *Spikelets* 1–2 flowered, with a rudimentary one also. *Outer bract* 1¾–2 mm. long and slightly broader, irregularly triangular-acute, with broad membranous margin, herbaceous portion ± apiculate, glabrous. *Middle bract* 2–2¼ mm. long and nearly as broad, orbicular-ovate (or -obovate), apex rounded or erose, hyaline with two veins, glabrous, less than half as long again as outer bract. *Inner bract* 4¾–5 mm. long, about 3 mm. broad, oval, ± obtuse, with broad membranous margin, herbaceous portion apiculate, glabrous, about 2½ times longer than outer bract. *Bracteole* 1, about 3 mm. long, irregularly obovate, apex rounded or erose, hyaline with veins, glabrous. *Calyx* about

5 mm. long, curved, infundibuliform, membranous and dilated above the middle (including lobes); calyx-lobes about 1 mm. long, triangular-ovate, plicate, tips ± obtuse; calyx-tube slender, about 3 mm. long, veins acute running either to base of lobes or further, but not to apex; calyx almost glabrous or sparingly and irregularly hairy on ribs and between same, with appressed hairs, from base to about half-way up calyx (including lobes). Calyx usually (? always) with a glabrous pedicel about 1¼ mm. long. *Corolla* about 6 mm. in diameter, violet.

Distribution.—*Sardinia*: Razzoli Island! Asinara Island! S. Catterina-pittinuri (Moris); Porto scusa, Porto Torres and intermediate islands (Barbey).

Var. OBTUSIFOLIA Rouy, Fl. Fr. x. 149 (1908).

S. minuta Salis-Marschlins in Flora, Zweiter band, 12, (1834); *non L.*

S. acutifolia Reichb. fil. Ic. germ. xvii. 64 (1855), excl. syn. et loc. ital.; *non Reichb. Ic. crit.*

S. rupicola Reverchon exsicc.!; Marsilly, cat. Corse, 118 (1872); *non Bad.*

S. rupicola vars. *depressa*, *capillata* et *bryoides* Reverchon exsicc.! sine descrip.

Limonium rupicolum O. Kuntze, Rev. Gen. pars. 2, 396 (1891).

Icones.—Reichb. Icon. Crit. ii. t. 186, f. 324! (non typ.); Reichb. fil. Ic. germ. xvii. t. 1144, f. 1!; Cusin, Fl. Fr. xix. t. 29!; Coste, Fl. Fr. iii. 3043!

Exsicc.—Schultz, hb. norm. cent. 9, 898! Kralik, pl. Corse, 748! Soc. Rochelaise, 3976! Reverchon, pl. Corse, 376! 377! 378! 379!

Radix supra in elongatas non confertas partes crebro partita; planta paullo plus scabrida quam in typo; folia plerumque anguste obovata vel lineari-obovata, plana, non setacea nec dense imbricata, leviter rugosa, margine ± revoluta, apice sæpissime ± obtusa (raro acuta vel rotundata) non retusa. Scapus plerumque 8–13 cm. altus, sæpe pauca folia juxta basin exhibens; rami ascendentes vel ascendenti-patentes. Spicæ ascendentes; bractea exterior brevior quam in typo; bractea interior quam exterior fere 4-plo longior; calyx omnino glaber aut raro sparsissime juxta basin adpressi-hirsutus.

Root divided at the crown into numerous elongating divisions, not forming a dense cushion. *Plant* rather more scabrid than in type. *Leaves* usually narrowly obovate or linear-obovate, flat, not setaceous nor densely imbricate, slightly rugose, margin ± revolute, apex usually ± obtuse (rarely acute or rounded) not retuse, 1–veined, furrow obscure. *Scape* usually 8–13 cm. high, often bearing a few leaves, or tufts of leaves, near its base. *Branches* ascending or ascending-spreading. *Spikes* ascending. *Spikelets* 1–2 flowered (usually 1). *Outer bract* 1–1½ mm. long, shorter than in type. *Middle bract* 1¼–2 mm. long, irregularly ovate. *Inner bract* 4½–5 mm. long, almost 4 times longer than outer bract. *Calyx* about 5½ mm. long, only slightly curved; calyx-lobes about 1¼ mm. long; calyx-tube about 3½ mm. long;

whole calyx glabrous or rarely with a very few appressed hairs near base. Calyx pedicelled or not.

Distribution.—East Corsica: Ajaccio! *South Corsica*: Bonifacio! Pertusatto! Cap de Fènne! *North Corsica*: Biguglia (Rouy).

Some authors, such as Nyman (Conspec. Fl. Eur. iii. 612, 1881) and Coste (Fl. Fr. iii. 163, 1904), use the name *S. rupicola* Badar. to include both the Sardinian and Corsican forms, whilst others unite them under the name *S. minuta* L. var. *acutifolia* (*e. g.* Boiss. in DC. Prodr. xii. 655, 1848; Mori in Parlatore, Fl. ital. viii. 585, 1888).

THE BRITISH ASSOCIATION AT MANCHESTER.

By J. Ramsbottom, M.A., F.L.S.

The eighty-fifth annual meeting of the British Association was held at Manchester, September 7th to 11th. As was befitting at the present period of storm and stress, most of the usual social functions of the meeting were omitted, an omission which, if it became customary, would make the meetings more formally scientific, but would have a deleterious effect upon the finances of the Association.

The Botany Section (K) was under the presidency of Professor W. H. Lang, who took as the subject for his address some aspects of the study of plant morphology, which branch of botany he regards as "the study and scientific explanation of the form, structure, and development of plants." This abandons the more customary recent views that morphology is restricted to genealogical problems. It is interesting to note the tendency to widen the field of the various branches of botany, a tendency which will end, it is to be hoped, in the production of botanists. Professor Lang himself sounded a warning—"We are brought up against a fact which is readily overlooked in these days of specialization, that Botany is the scientific study of plants." The address is notable for a somewhat broader philosophical outlook than is customary in present-day botany. It was stated that in the history of morphology, after it had ceased to be the handmaid of the systematic botany of the higher plants, we may broadly distinguish an idealistic period, a developmental period, and a phyletic period, the last of which has persisted to the present time, and which at the beginning was illustrated by elaborate hypothetical phylogenetic trees, and now "the most recent and reliable graphic representations of the inter-relationships of plants look more like a bundle of sticks than a tree." There is to be noted a sign of a change of attitude towards morphological problems and an increased tendency to look upon development and construction from a causal standpoint. Developmental physiology, together with genetics, would be the president's idea of General or Causal Morphology. General morphology agrees with physiology in its aim being a causal explanation of the plant and not historical.

Its problems would remain if the phyletic history were before us in full. Morphology must take the complicated form and its genesis in development, and strive for a morphological analysis of the developing plant. The methods available in causal morphology are the detailed study in selected plants of the normal development and its results, comparison over as wide an area as possible with special attention to the essential correspondences (homologies of organization) arrived at independently, the study of variation, mutations, and abnormalities in the light of their development, and ultimately critical experimental work. The fern was taken as presenting all the main problems in the morphology of the vegetative organs of the higher plants, and was mainly used for the attempt to look at many of the old questions from the causal point of view—individual development, construction of the shoot, alternation of generations and the seed and its embryo. In the president's idea the efforts towards the solution of the fundamental problems of the organism can be made without any antagonism between pure and applied botany: "indeed, there is every advantage in conducting investigations on plants of economic importance. It would be well if every botanist made himself really familiar with some limited portion of applied botany, so as to be able to give useful assistance and advice at need. The stimulus to investigation would amply repay the time required. Even in continuing to devote ourselves to pure botany we cannot afford to waste time and energy in purposeless work. It is written in *Alice in Wonderland* that 'no wise fish goes anywhere without a porpoise,' and this might hang as a text in every research laboratory."

Following the presidential address Prof. Julius MacLeod, of Ghent University, gave a very suggestive paper "On the Expression of Measurement of Specific Characters, with special reference to Mosses." The genus *Mnium* was taken in illustration, seven species of which were treated. The lengths of successive leaves measured from the base to the summit of a fertile stem show that the length increases up to a maximum and then decreases. As the number of leaves is variable, this part of the stem is divided into ten intervals, measuring the minimal, median, and maximal value of each character of the leaves of each interval. The figures of each given interval thus become comparable with the figures of the same interval in all the stems and species. Taking various characters, the character may increase from the base to the longest leaf, and decrease beyond it; the character may reach its maximum below the longest leaf; or the character may reach its maximum in the leaves which are above the longest leaf. The values of the characters of each leaf depend upon the position of the leaf. As each character has its own independent curve, and as much diversity exists among the curves, the result is a practically unlimited number of combinations. The description of a species according to this method consists of a certain number of tables giving the period of each character, the figures being based as far as possible on specimens from

several localities. The characters taken were: length, breadth, breadth at the base, number of cells at the place of the greatest width, breadth of border and number of the cells of the border at the same place, number of teeth at the border and on the nerve, length of the nerve (reaching the summit or not), tooth at the summit of the leaf (present or absent), total number of leaves of the fertile stem. Examples of the identification of a specimen were given from tables in which the minimal and maximal values of the leaves of the tenth interval were stated, *i. e.* the longest leaves. It was possible to find the name of the species by two characters, and Professor MacLeod showed that, as we have at our disposal a dozen or so characters, we may hope to identify a moss species by this method, no matter how large the genus.*

After a short aimless discussion Dr. M. C. Stopes gave a hurried account of the Aptian (Lower Greensand) Flora of Britain. The flora consists of forty-five species, containing eight Cycadophyta, twenty-seven Conifers, and five Angiosperms. Most of them show the cell anatomy well preserved. The Angiosperms are all woody. With the Conifers they show seasonal growth, and suggest that cooler weather and well-marked seasons of the Lower Greensand afforded a great contrast with the "tropical climate" of the Wealden of Southern England. A new genus and several new species were mentioned.

In the afternoon Mr. W. L. Balls gave the best attended paper of the section, which was understandable considering the local interest in such a subject as the application of science to the cotton industry. "The cotton industry does not consist of spinning and manufacture alone, but of cotton growing as well. Co-operation between the spinner and the grower is desirable, and for this the scientists should be able to provide a language common to both." Cotton growing need not be an empirical art, and with co-operation on lines suggested in the paper the strength of yarn might be increased very appreciably.

Thursday's meeting opened with an account by Miss T. L. Prankerd of her preliminary observations on the nature and distribution of the statolith apparatus in plants. Excellent lantern slides illustrated the paper. The term statolith is used to designate a body free to fall within the cell (the statocyte) which contains it. Many interesting and rather unexpected facts were mentioned. The author considers the statolith an intensive mechanism, the simplest form of statocyte being the living cell, which, passing through transitional stages, reaches its highest expression in the cell containing relatively heavy bodies differentiated both in size and mobility.

After a dull discussion, Dr. S. M. Baker gave an account of a liquid pressure theory of the circulation of sap. The basis of the theory is the assumption that the root is divided into two regions,

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* *E. g.* Professor MacLeod has worked with thirty-eight characters in about ninety species, and twenty varieties of the genus *Carabus*, but his work was interrupted by the war.

the root-hair zone, specialized for salt absorption, which is permeable to liquid water; and the growing region of the root tip, specialized for water absorption, which is impermeable to liquids, but permeable to water vapour. The paper was too physical to be analysed here, and when it is published it will be seen whether external pressure will nullify its cohesion.

Dr. E. M. Delf then described the effect of temperature on the permeability of protoplasm to water. By an apparatus which she described, it had been possible to observe minutely the gradual contraction of a plant tissue undergoing plasmolysis, and then to determine the rate at which water passes out through the protoplasm by exosmosis. By making these observations at different temperatures, the effect of temperature on the permeability of protoplasm had been investigated.

Mr. A. M. Smith gave the last paper of a morning devoted to physiology, describing some rather strange results of an investigation of the respiration of partly dried plant organs.

In the afternoon there was an innovation that might well be followed at future meetings. Various members gave demonstrations of their work in the botanical laboratories, and it was possible to examine the specimens themselves, and discuss matters with the readers of papers, which saved a lot of useless questioning during a time supposed to be given over to discussion. It was the pleasantest time of the meeting, and only marred by the inevitable posing to be photographed—but the antics of the photographer, and his method of address, relieved the boredom.

The proceedings of Friday were congested, as it was desired to finish the proceedings of the section on that day. Professor F. O. Bower gave a long paper on the phyletic arrangement of the Filicales, with special regard to the Dipterids and Pterideæ. The paper was too full to give an account of it here; the treatment followed that set forth by the author in his many masterly contributions to the solving of fern problems.

Another valuable paper followed, on the deductions to be drawn from the figures of rarity of the Ceylon Flora, by Dr. J. C. Willis. According to him the commonness of a species depends upon its age (in the country concerned), and local endemic species are simply new species in the earlier stage of spreading. From the fact that species of wide distribution (which must be the oldest) increase in number up the scale of commonness, whilst the endemics (the youngest) increase downwards, and the Ceylon-Peninsular-Indian species are comparatively evenly distributed along it, such tables represent three stages in the history of a group of species, the distribution of the "wides" being the latest. From given tables it was concluded that there is no evidence that any species are dying out: that the dry zone of Ceylon was on the whole peopled with plants a good deal later than the wet, and received its flora in two ways, either directly from the dry zone of India or from the wet zone of Ceylon; the plants entering from the latter route becoming more quickly common: and that there is little to choose in average age in Ceylon between herbs and

shrubs and trees, though there is evidence to show that the Monocotyledonous trees and shrubs are very old, and that the Gamopetalæ as a whole are older in Ceylon than the Archichlamydeæ.

A paper on the newer type of Plant Geography followed. Dr. E. J. Salisbury described the periodicity due to coppicing exhibited by the ground flora of Oak-Hornbeam woods on Clays and Loams. The effect of light and shade, effects known in a general way to all field botanists, were analysed, and some unlooked-for effects of coppicing, *e. g.* the fact that the coppiced wood has a higher acidity and lower water content than the uncoppiced, were noted.

After a discussion, Prof. Weiss read a paper by Prof. T. G. B. Osborn on the morphology of *Selaginella uliginosa*, and one by Mrs. E. M. Osborn recording preliminary observations on an Australian *Zygopteris*—which in its stele of the *Ankyropteris Grayi* type, the absence of axillary branches, and the simple Clepsydropsoid petiole is a most interesting addition to the Zygopterideæ.

In the afternoon Prof. W. B. Bottomley gave a description of the formation of auximomes from nitrogenous organic substances. This was principally an account of efficacy of bacterized peat which is particularly rich in auximomes, the proportion of which increases with the progressive humification of the organic matter. The daily papers have fully described the results of Professor Bottomley's experiments, which, if they succeed on a large scale, will mark one of the greatest advances in the application of botanical science.

The following paper by Dr. D. Ellis on fossil fungi and fossil bacteria was also somewhat revolutionary. An investigation of the ferruginous and fossiliferous rocks of Great Britain showed that some of the organic fragments in the ferruginous rocks had been in a state of putrefaction when engulfed. A study was made of the micro-organisms which were responsible for this putrefaction. A fossil fungus, *Physomycetes Fordinghamii*, was described possessing what were considered to be sporangia probably enclosing four spores. A similar fungus, but without sporangia, was described under the name *Palæomyces*. The bacteria mentioned were a species of *Actinomycetes* and of *Micrococcus* and two species of *Bacillus*. It is very probable that there will be a repetition of the old discussions on these new forms. A second fungus paper, by Prof. A. H. R. Buller, described the spore discharge in the Uredineæ and Hymenomycetes. In both groups, just before the discharge of the basidiospore, a drop of fluid is excreted where the spore is attached to the sterigma. On discharge the drop is carried with the spore. The physics of the mechanism seemed to cause general anxiety.

Prof. F. W. Oliver made some general remarks on fruits and seeds. The paper seemed to contain a good number of new ideas which will probably call for discussion when published. A long day was brought to a conclusion by an account of the vegetative anatomy from an ecological standpoint of *Molinia cœrulea* by the Rev. T. A. Jeffries.

Most of the papers were illustrated by lantern slides. The meetings of the section were well attended, but in spite of this, the discussions arising out of the papers were, as a whole, feeble in the extreme. This was doubtless to some extent due to the fact that the time given on the programme for both paper and discussion was usually exceeded by the former alone. By the absence of a discussion the reader of the paper suffers, as one would think that the sole object in reading a paper at such a meeting was to invite criticism before results are published.

Manchester belied its reputation in the way of weather, but a botanical excursion had not been arranged. The botanists of the Manchester University did all they could in the interests of the section.

TRINOMIALS.

The Editor's remarks (p. 254) on trinominals, so far as they refer to me and to the *Cambridge British Flora*, are apparently based on a misconception, and are certainly misdirected. I am as much opposed to trinominals as Mr. Britten himself, as is obvious from my direct reference to the matter on p. xiv. of the Introduction to vol. ii. of the *Flora* in question. There I plainly stated that "a trivial name used *per se* is virtually meaningless, as it is indistinguishable from a name similarly used of a subspecies, race, variety, subvariety, or *forma*. Similarly, trinominals (*e.g.*, *Salix cinerea aquatica*) are ambiguous, as it is not known whether the plants so designated are to be regarded as subspecies, races, varieties, subvarieties, or *formæ*." Mr. Britten quotes p. xvii. of my Introduction; but on that page the question of trinominals does not arise. There I justified a totally different point, namely, that a species with varieties should be wholly subdivided into varieties; and I cannot for a moment agree that such a subdivision of a species necessitates the use of trinominals, or indeed that it has any relation whatever to trinominals.

C. E. Moss.

Dr. Moss's note renders the present a favourable opportunity for the discussion of the subject indicated in the course of a notice of the Watson Exchange Club Report on p. 189. I have had the opportunity of talking the matter over with Dr. Rendle, and the following remarks have his concurrence.

I was not unaware of Dr. Moss's condemnation of trinomials, and I did not intend to suggest that he had advocated, defended, or actually employed them. Nevertheless I am still of opinion that the logical outcome of the action justified by him on p. xvii of the *Cambridge Flora*, which he considers "a wholly different point" must result in the substitution of a name consisting of three words for one of two, and this, even if the third word is separated from the two preceding it by the abbreviation "var.," seems to me to all intents and purposes a trinomial. The only difference, as it seems to me, between Dr. Moss's method and the

partial American practice as stated in Britton and Brown's *Illustrated Flora* (i. p. xi) is that the former retains and the latter omits the word "var." : that in the latter case "varieties are printed as trinomials, *e.g. Rynchospora glomerata paniculata*, the contraction var. or the Greek letters α or β commonly inserted between the specific and varietal name being dispensed with," whereas Dr. Moss writes "*Populus tremula* (a) var. *sericea*." In the former case, however, *Rynchospora glomerata* has a definite existence apart from the forms which the Americans term sub-species—"the name variety is relegated to horticultural species"*; whereas in the latter *Populus tremula* is distributed into two varieties, and the binomial has no separate being.

It will make my meaning clear if I quote Dr. Moss's explanation of his "position with regard to the subdivision of species into varieties." "There are," he says, "two plans, each of which finds favour in certain circles. One is to regard a certain form of a species as typical of that species, and to regard any deviations for that type as varieties. The second plan is to subdivide the same species wholly into varieties, just as a genus is wholly subdivided into species. *Populus tremula* may be taken as an illustration. Two varieties of this are recognized as British. One is a form whose young leaves are silky, and the other form whose leaves (excepting the leaves of the suckers) are always glabrous or almost glabrous. If the first of the above plans be adopted, it becomes necessary to decide which of the two varieties shall be regarded as the type. Supposing the silky variety to be regarded as the type, the British forms would be written thus:—

Populus tremula
(*b*) var. *glabra.*

If the glabrous variety be regarded as the type, then the British forms would be written thus:—

Populus tremula
(*a*) var. *sericea.*

However we ourselves have decided not to adopt this first plan but the second; and accordingly we write the British forms thus:—

Populus tremula
(*a*) var. *sericea*
(*b*) var. *glabra.*

We have decided on this plan for two reasons. First, it is (so far as we are able to judge) quite arbitrary to decide which of the forms of a species is the type; and it is unusual to find agreement among botanists as to which form is to be regarded as the type and which the deviation from the type. We frequently find that the form which a botanist regards as the type is merely the form which he happens to have come to know first, or the form which is more abundant in the district which he usually investigates; and we find that this view of the type of the species sometimes prevents him from taking a broad view of the relationships of the different forms of the species. Secondly, it is impossible, if the

* Bull. Torr. Bot. Club, 1904, 251.

first plan be chosen, for a botanist to record definitely the existence of a species in a given locality without committing himself to the recording of a particular form of that species, and of a form, it may be, of whose distinguishing characters he is wholly ignorant. By adopting the second plan, it is possible to record the existence of a species in a particular locality without being so committed; and, if it be desired to make the additional observation that the species exists in that locality in a particular form, it is only necessary to add the name of the particular variety, whichever it may happen to be, to that of the species" (p. xvii).

I have quoted the whole of passage in which Dr. Moss describes "how species are divided into varieties," because, although some of it is irrelevant to the point at issue, it is desirable that the readers, not all of whom possess *The Cambridge Flora*, should have it before them in its entirety.

The example which Dr. Moss has chosen as an illustration seems to me unfortunate. In the case of *Populus tremula*, there can be no question as to "which of the two varieties shall be regarded as the type," for Linnæus, the founder of the species, describes it as "foliis . . . utrinque glabris" (Sp. Pl. 1034). This being so, it seems strange Dr. Moss should follow Syme in placing it as *b.* rather than as *a.*

The plan which Dr. Moss rejects seems in accordance with that contemplated by the Rules. "All species . . . are designated by the name of the genus to which they belong followed by a name (or epithet) termed specific . . . forming a combination of two names, a binomial, or binary name" (Art. 26). "Names of subspecies and varieties are formed like specific names and follow them in order, beginning with those of the highest rank" (Art. 28). The reference to varieties surely indicates the existence of a definite type from which these deviate, not a mere abstraction composed of varieties, as Dr. Moss seems to imply in the example hereafter to be adduced.

When a new species is described, the description of its author and the material on which it is based are usually accepted as typical for the species. Dr. Moss's statement of this position hardly seems to me accurately to represent the case; it is not the "regarding of a certain form as typical," but the recognition of a species as an entity apart from varieties which may afterwards (or at the same time) be described. Such forms or varieties differ from the type of the species in certain characters, but the original character of the species remains and is usually easily recognized. Take as an example *Rumex Hydrolapathum*; "the common British form" of which is named by Dr. Moss "*R. hydrolapathum* var. *vulgaris*." Of what is this a variety? And what existence has *R. Hydrolapathum* apart from it? The name has never been applied to the var. *latifolius*, which has never been included in it save as a named variety and is not likely to be confused with it: why then add an entirely useless synonym? Why, parenthetically, does Dr. Moss in this case write "var." and in others (*a*) or (*b*)?

The system proposed seems manifestly unjust to botanists who have carefully described a species, differentiating it into type and varieties, and would seem to make them say what they have not said. To take a recent example: Mr. Salmon (p. 241) describes very fully *Statice minuta* L., separating from the type two varieties: on Dr. Moss's method, it would be open to any anyone to refer to the type as "*S. minuta* var. *vulgaris* nobis," or to divide it into

(a) *vulgaris*
(b) *microphylla*
(c) *dissitiflora*

the first name being of his own invention. By this method *S. minuta* would be reduced to an abstraction, or to a synonym of *S. minuta* var. *vulgaris*, following the example of Dr. Moss, who writes "*R. hpdrolapathum* var. *vulgaris* nobis: *R. hydrolapathum* Trimen in Journ. Bot. xii. 35 (1874)."

From the standpoint of compilers of local lists, there is something to be said for the citation of the abstract species, on the ground stated by Dr. Moss in the passage quoted. But such a citation may be misleading: thus in the event of a new variety being described next year (var. *x*) of *R. Hydrolapathum*, the citation of the abstract name in a list published in 1920 presupposes the inclusion of this, whereas by the citation of the specific name as usually understood, var. *x* would be inferentially excluded. On the other hand, the monographer, having full material before him, would accept the original description as the type of the species; "the names of subspecies and varieties would," as Art. 28 expresses it, "follow them in order." On Dr. Moss's plan, the type would be described as "(*a*)" or as "var. *vulgaris*": and it appears to me that this practically amounts to the adoption of a trinomial system.

I am of course aware that in adopting his second plan, Dr. Moss can cite numerous Continental precedents, and that he has to some extent been anticipated by Syme in *English Botany*. But the prominence given to it in *The Cambridge British Flora*, and the importance of that work, seem to me to call for the protest which I have ventured to make.

JAMES BRITTEN.

SHORT NOTES.

AGRIMONIA ODORATA (p. 280).—Mr. Thompson omits to mention characters referred to by Archer Briggs (*Flora of Plymouth*, 104), who points out that "even when out of flower and fruit, its agreeable odour serves to distinguish it from the common species. Moreover, it has silkier and longer though less densely disposed hairs on both leaves and stem, causing the foliage to look less clothy. The leaflets are considerably larger and not so flat, sometimes having the edges incurved." I have recently examined a large number of dried specimens from England and the

Continent, and find that these characters hold good. Crépin (*Notes Pl. Rares Belg.* fasc. i. 13 (1859) has a useful note on *A. odorata* :—"Le fruit, chez l'*A. odorata*, offre presque toujours deux akènes à la maturité, et si, par hasard un des ovaires vient à avorter, les sillons du calice se montrent plus marqués, sans cependant arriver à la longueur de ceux de l'*A. Eupatoria*. Dans ce dernier cas la forme du tube calicinal, celle du bourrelet couronnant le fruit à la maturité, ainsi que la direction des épines ne sont point altérées. Les caractères distinctifs de l'une et l'autre espèce ne semblent point dépendre d'un développement plus ou moins considérables ; les très-grands pieds de l'*A. Eupatoria*, cultivés ou sauvages, conservent toujours le facies propre à cette espèce." I note the presence of yellowish glittering glands, often in abundance, on the under side of the leaves in *A. odorata*. These glands are occasionally found on the leaves of the commoner species, but are much less conspicuous owing to the denser pubescence ; this pubescence, being more in the nature of tomentum. The characters afforded by the fruiting calyx are not fully described in English books. In addition to having the exterior rows of spines reflexed, it is larger, less attenuated at the base, being often rounded, and not obscure as in *A. Eupatoria*. The furrows in the calyx are sometimes obsolete in *A. odorata*.—A. Bruce Jackson.

——Mr. A. B. Jackson lately revised my herbarium-sheets. In Journ. Bot. 1914, p. 165, a plant from Fortingal, Mid-Perth (my no. 3789), was queried as *A. Eupatoria* var. *sepium* Bréb. ; but he writes (confirming our original opinion) : "I should refer this without much hesitation to *A. odorata*. The pubescence is too sparse and the subfoliar glands too abundant for *A. Eupatoria*. It is certainly not *A. Eupatoria* var. *sepium* Bréb., which has eglandular leaves." Of a specimen gathered by Dr. J. Cosmo Melvill in August, 1890, by the River Ruchill, Comrie, Perthshire, he says : "*A. odorata* Miller. Fruit typical." On the other hand, he remarks respecting two luxuriant specimens which I collected near the canal, west of Savernake Station, both in North and South Wilts, v.-c. 7 and 8, on July 9th, 1915, and which Rev. T. A. Preston referred, when fresh, to *A. odorata* : "I think this is *A. Eupatoria* L. Note the dense pubescence on the under surface of the leaves. . . . This plant and the next sheet seem to be more like the var. *sepium* Bréb. than your Scotch plant, provisionally referred to that by Mr. Bennett. Brébisson, Fl. Norm. 105 (1859), says it resembles *A. odorata*, but differs in the eglandular leaves, the non-recurved spines of the fruiting calyx, and the teeth of the leaves, which are broader and less acute." So far as material without fruit goes, Mr. Jackson's suggestion seems to be a very likely one.—Edward S. Marshall.

Branched Spike in Hordeum murinum L. —I recently gathered on an embankment at Kew Bridge railway station, Middlesex, a stem of *Hordeum murinum* bearing a trifurcate spike, a smaller lateral spike arising on each side from just below the

base of the normal spike; each of the lateral spikes being about half the size of the central one. There was no trace of fasciation in the stem itself. I had not time to search the bank, but I saw in passing one other stem with a single lateral spike at the base of the normal one, and there would probably be more found if sought for. This form does not appear to have been noticed in *H. murinum*, or, indeed, in any of the wild species of the genus. It is not referred to by Masters. Penzig (*Pflanzen-Teratologie*, Bd. ii. p. 480) has "*Hordeum murinum* L. Bei Modena fand ich eine in der Mitte gabeltheilige Aehre; Herr Prof. Camus hat von ebenda auch eine Zwillings Aehre auf einfachem Stiel beschrieben" (Camus, *Anomalie e varietà nella Flora del Modenese*, terza contrib., 1886). Branched spikes occur in *Lolium*, and in cultivated forms of *Triticum*, &c., but they do not appear to be a common sport. The specimen has been placed in the Kew Herbarium.—H. N. Dixon.

Linaria arenaria DC.—Mr. F. J. Hanbury kindly showed me this on September 11th in its station at the Saunton end of Braunton Burrows, N. Devon (see Journ. Bot. 1914, pp. 276, 310). It was still in flower, and appeared to be confined to one or two contiguous sandy hillocks; but it is evidently spreading. Several years ago Mrs. Godden, of Tunbridge Wells, sent me a specimen from this locality, and remarked that it was then seen over a space only about eight yards square. I have little doubt that it was purposely sown by someone who had found the species on Northam Barrows; had it been windborne, it would have occurred nearer to the southern (lighthouse) end. The assertion that, as a native, it is restricted to the neighbourhood of Cherbourg is incorrect; Lloyd notes it as being common on maritime sands from the Gironde to the Côtes du Nord, and it was observed in more than one station in Charente-Inférieure (July, 1884) by the Rev. R. P. Murray and myself—notably plentiful at Pointe de Fouras.—Edward S. Marshall.

Wolffia Michelii (p. 311).—By way of supplement to Mrs. Sandwith's note on the invasion of North Somerset by *Wolffia Michelii* I may say that on September 23rd I found the plant in a fifth locality—a pond and a connected rhine—east of Burnham towards Edithmead. It seems to me that the rapid dispersal of this duckweed in the Bristol district may be accounted for by the movements of aquatic birds, wild duck in particular being quite common in our lowlands.—Ida M. Roper.

Samolus Valerandi.—In Britain this plant is usually, though not always, found in wet, sandy or alluvial ground rather near the sea; and chiefly along the west coast. I have seen it in various habitats on the Continent, *e. g.* on wet rocks in the Eastern Pyrenees, and once or twice in similar places at considerable elevation in the Alps of Central Europe (it is rare in Switzerland); and at Beau Rivage, in the Var, on the low sea-cliffs, where fresh water sometimes trickles to the beach below. But until this autumn I never saw it growing in woods. It is luxuriant, and

covers large patches in damp, shady places in woods on Upper Greensand on the lower slopes of the Blackdown Hills, near Pitminster, S. Somerset. Its habit was such that at first I took it to be a white-flowered, broad-leaved form of *Myosotis cespitosa*. Some of the stems were two feet long and rooting at the nodes, a peculiarity mentioned by Hooker in the *Student's Flora*. However, that author's description of the normal height of this plant ("1–2 ft.") is in my experience exaggerated: it is frequently only six or eight inches high, tall specimens averaging about a foot. *Samolus Valerandi* is widely spread throughout the temperate regions of the northern hemisphere, and it occurs in the Himalaya. The few other species of this small genus appear to be confined to the southern hemisphere.—H. S. THOMPSON.

REVIEWS.

The Study of Plants, an Introduction to Botany and Plant Ecology. By T. W. WOODHEAD, M.Sc., Ph.D., F.L.S. 8vo, pp. 440, with 257 text-figs. and plates. Oxford: Clarendon Press, 1915. Price 5*s.* 6*d.*

THERE is a welcome freshness about Dr. Woodhead's addition to the pile of botanical text-books. There are certain fundamental facts and principles with which the student of botany must become familiar, and a thoroughly well-trained teacher will probably prefer to work out his own course, but with the widespread teaching of botany at the present time there are many teachers who will be glad to have suggestions for a course which is vastly superior to that indicated by the ordinary cheap text-book.

The course of work followed by Dr. Woodhead is directed, in the main, to the establishment of the fundamental principle of Plant Physiology. A conception is obtained of the plant as a whole—the garden stock is the example illustrated—and then the form and structure of the parts—embryo, root, shoot and bud are studied in association with their work. Simple experiments are described to demonstrate the more important functions. This forms the subject-matter of Part i. In Part ii. the reproductive organs are considered. The structure of the flower is studied in various examples from the point of view of pollination and fertilization, and this is followed by a chapter on familiar lines on the structure of fruits, and a second on dispersal.

Part iii., Systematic Botany, is weak. It consists of a brief historical section and short descriptions of a few of the commoner British families. In our opinion a more satisfactory result would have been gained by working into this section the next part, which gives a good account of the general characters of a number of common trees and shrubs, and introduces the Gymnosperm. No reference is made to the groups below the flowering plants in the scale of evolution. In Part v., Ecology, Dr. Woodhead is on his native heath, and the ten chapters dealing successively with the factors determining plant-habitats and communities, the origin, varying characters and properties of the soil, and the

characteristic features of different localities such as hedgerows, woodland, humus, grass-land, water and marsh, sea-coast, moorland and alpine, form an excellent introduction to the study of this phase of the subject.

The volume is profusely and well illustrated by good text-figures and photographic plates, which have been specially prepared for the book. An appendix of twenty pages contains a selection of examination papers set by various examining boards.

A. B. R.

The Botany of Iceland. Edited by L. K. Rosenvinge and E. Warming. Part i. 2. An account of the physical geography of Iceland, with special reference to the plant life by Th. Thoroddsen. Copenhagen. (London: John Wheldon & Co.) 1914. Pp. 191–343. With 34 figs. in text.

The first portion of this volume (pp. 1–190) was published in 1912, and concerned itself with the Marine Algal vegetation (see Journ. Bot. 1893, p. 68). It is difficult to understand such a sequence of monographs; one would have expected the present to have formed the first portion of the survey when arranged on completion. The scheme is for young systematists to write monographs on the various phases of plant life, though the present volume is by one who apparently knew the island in 1882. The account is full of interest, and is illustrated by many very clear photographs. The first chapter is concerned with general topography and geology. The features of Iceland are vividly described —a continuous tableland with an average height of 700–1000 metres above sea-level, more than two-thirds of the country being of such a nature that almost no vegetation can thrive there. The conditions pertaining to surface and soil are next considered; the island is built up of basalt, tuffs and breccias, but basalt is the fundamental rock. The following chapter deals with climate, in which the various factors and their probable effects are stated. The two last chapters (pp. 292–343) give an account of the general distribution of plant life and a sketch of the chief plant-formations. "It is expected that later on in this work a more accurate and detailed account of the plant-geographical conditions will be given, and the ecological conditions and the different plant-formations will be described and analysed by different specialists." This preliminary account is admirable; the description of the flora is illuminated by extracts from the old sagas and by historical facts as well as by points in the economy of the island relating to man or to other animals. "Generally speaking, it may be said that the same kind of vegetation prevails throughout the island; taken as a whole, there is no great difference between north and south, high and low"—though the composition of the plant-formations naturally varies somewhat. The monograph is crammed with facts, and serves as an excellent introduction to the study of the vegetation of Iceland in all its phases.

J. Ramsbottom.

The Flora of South Africa. By Rudolf Marloth. Vol iv. Monocotyledones. London: Wm. Wesley & Son. Cape Town: Darter Bros. & Co. Price £2 2*s.* net.

The first volume of this work was noticed in this Journal for 1914, p. 28; the fourth (second in point of issue) is now before us. In consequence of the plates for volumes two and three not being ready, it has been thought advisable to defer the publication of those volumes, with the result that the Monocotyledones are now given to the world. This, of course, is no drawback to the work's usefulness, the Monocotyledones being quite distinct from the other plants; indeed they could, without impropriety, have been made the subject of a separate treatise, and one of surpassing interest to the lover of beautiful flowers, seeing that the *Orchidaceæ*, *Iridaceæ*, and *Liliaceæ*, families for the loveliness of whose flowers the Cape is so celebrated, would be included in it. Our former notice explained the admirable plan upon which Dr. Marloth was working, and the volume under notice is at least upon a level with its predecessor. We have the same carefully compiled clavis of genera, the same excellent judgement in selecting examples for illustration by word and brush, and similar useful notes on points of structure and life-history. Special mention may be made of the optical phenomena concerned in the production of the colour of certain flowers; of the power of plants to regulate the depth of their subterranean organs; of the arrangement of the vascular bundles in the leaves of *Iridaceæ*; of the symbiosis of *Rhizoctonia* with orchid seeds. Nor should the lavishly illustrated account of the genus *Aloe*, including the manufacture of Cape aloes from *A. ferox*, a subject very fully treated, be left unnoticed. As before, the popular names, both English and Dutch, are in every case given.

The illustrations, while naturally not so bizarre—with the exception of *Strelitzia*—as were those of vol i., have afforded more favourable scope for the artists employed in producing the plates, many of which are a perfect feast of colour. The numerous uncoloured plates, too, are beautiful examples of their kind, and those showing the plants in their natural habitats will be appreciated by students of ecology.

Dr. Stapf has revised the grasses, and other experts have helped in connection with special families. The system adopted is, as before, that of Engler, while the *Flora Capensis* has been mainly followed in the arrangement of the genera. With its forty-two coloured and eighteen monochrome plates and numerous inset figures this work deserves and is hereby offered our hearty congratulations.

S. M.

BOOK-NOTES, NEWS, &c.

David Thomas Gwynne-Vaughan died on September 4th at the comparatively early age of forty-four. Born at Llandovery in 1871, he was educated at Monmouth School and then went up to Cambridge as a scholar of Christ's College. On leaving

Cambridge he was a schoolmaster for a short time, but then went to Kew to work in the Jodrell laboratory under Dr. D. H. Scott. His investigations on the anatomy of the *Nymphæaceæ* and *Primulaceæ* in 1897 led to his appointment as assistant in botany at Glasgow University, which post he held until 1907, when he became head of the botanical department at Birkbeck College. He was appointed professor of botany at Belfast in 1909, and in 1914 became professor at Reading. Gwynne-Vaughan's work on the vascular system of ferns and his researches in collaboration with Dr. R. Kidston on the fossil Osmundaceæ will take their place amongst the solid contributions to the science of botany, being marked both by carefulness and brilliancy. The news of his death cast a shadow over the botanical section at the British Association, and after the presidential address the meeting was adjourned during the time of the funeral. Gwynne-Vaughan seemed to have a genius for friendships, and his store of information, his humour, and his keenness endeared him to all botanists.

By the death on June 4th of Henry Peirson, of Hertford, the *Journal of Botany* loses an old subscriber. He was born at Hertford, October 23rd, 1852, and from his schooldays at the Friends' School at York had been a keen botanist, and had acquired a considerable knowledge of British plants. During many years of residence at St. Mary Cray, Kent, he had become acquainted with the flora around Sevenoaks and Dartford, paying especial attention to the orchises of that part of the country; he contributed notes on a hybrid orchis found by him at Sevenoaks (*Orchis maculata* and *Gymnadenia conopsea* = × *G. Legrandiana* Camus) to this Journal for 1899, 360; 1907, 278. For the last sixteen years Peirson resided at Hertford, and made a study of the flora in its neighbourhood. One of his last observations was that on *Azolla* in the Lea Valley, published in our last issue. His father, Daniel Peirson (1819–99), a schoolmaster of Hitchin and Reading, and subsequently at Hertford, was also keenly interested in botany. He had a wide acquaintance with Hertfordshire plants, and contributed many localities as to the habitats of plants to the second edition of the *Flora Hertfordiensis*.

The nineteenth annual autumn fungus foray of the British Mycological Society was held at Swansea, September 27th to October 2nd, under the presidency of Mrs. Carleton Rea. Excursions were made during the week to the various types of wood in the neighbourhood, and though the number of species was not very large owing to the "run" in August and the dry weather afterwards, many interesting agarics were found and several microfungi were added to the British list. On Tuesday evening Mr. Carleton Rea, at the invitation of the local Natural History Society, read a paper on "Dry Rot," which seems to be prevalent in Swansea. On Wednesday evening Mrs. Rea delivered her presidential address, "Notes on Fungus Illustrations," which

dealt with the numerous ancient and modern efforts at fungus reproduction from the artist's standpoint: a selection from the president's large collection of water-colour paintings of the larger fungi was on exhibition during the week. Mr. J. Ramsbottom read two papers on Thursday evening: "Notes on the History of the Classification of the Phycomycetes" and "Colour Standards." The following evening Mr. A. D. Cotton showed some interesting coloured lantern slides of Clavariæ, and Mr. H. W. Wakefield a fine series of lantern slides of the common fungi. Mr. E. W. Swanton, of the Haslemere Educational Museum, was elected President for next year, Miss G. Lister re-elected Vice-President, and Mr. Carleton Rea, Secretary and Treasurer. Lyndhurst was selected as the centre for next year's autumn foray.

Owing to the publication of Oberthür and Dauthenay's *Répertoire de Couleurs* (1905), Klincksieck and Valette's *Code des Couleurs* (1908), and Ridgway's *Color Standards and Color Nomenclature* (1912), which have come more or less into general use, the question of a colour *standard* was proposed by the British Mycological Society as a subject for discussion at the conference of delegates at the British Association. Mr. J. Ramsbottom read a paper in which the previous attempts to provide colour charts were mentioned and criticized, and the following suggestions were made:—The recent schemes which aim at completeness are far too complicated and far too expensive to come into general use: a primary scheme of about two hundred colours would seem sufficient for naturalists except in such branches as horticulture, mycology, and ornithology. A fair sized, even sample of colour should be provided, and these should be as permanent as modern colour painting or colour printing make possible. They should be in book form and standardized by modern physical and chemical methods. The colours should be named, and where possible referred to common natural objects. A few hints should be given as to the best way of comparing colours, having regard to texture of surface and optical illusions. Such a chart would be very inexpensive and would be practical. Special editions could be prepared with a larger range of the colours required in special branches of science, but if the scheme were generally adopted it would be best to have ranges for each of the colours of the primary scheme. The discussion which followed the paper concerned itself principally with the best means by which such a scheme could be practically realised.

A new part of the *Flora Capensis* (vol. v. Sect. 2, part 2) contains the conclusion of Mr. T. G. Hill's monograph of the *Santalaceæ* and the first instalment of the *Euphorbiaceæ*, in which Mr. N. E. Brown describes 183 species of *Euphorbia*, the descriptions being accompanied by numerous interesting notes.

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THE

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EDITED BY

JAMES BRITTEN, K.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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THE JOURNAL OF BOTANY was established in 1863 by Dr. Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of general Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains. In 1896 it became necessary to increase the size of the Journal, owing to the number of papers sent for publication: the number of plates was at the same time augmented.

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THE FUNGI OF EAST DORSET.

By the Rev. E. F. Linton, M.A., F.L.S.

(Concluded from p. 321.)

Class I. BASIDIOMYCETES.

Order I. Hymenomycetes.

Family 2. Polyporeæ Fr.

Boletus luteus L. Martin Wood. Plantation south-east of Cranborne. Two woods, Edmondsham. Near Mt. Pleasant, Horton.—*B. flavus* With. Rempstone, *C. B. G.* Two woods, Edmondsham. Plantations near Cranborne, and near Alderholt Station.—*B. chrysenteron* Fr. Norden, *C. B. G.* Woods in and near Edmondsham.—*B. æstivalis* Fr. Luckford Copse, Purbeck, *C. B. G.*—*B. variegatus* Swartz. Norden; Fitzworth Heath, *C. B. G.* Ferndown, *Mrs. Pringle.* Plantation near Alderholt.—*B. badius* L. Norden, *C. B. G.* Ferndown, *Mrs. Pringle.* Lower Mannington, *Mrs. Baker.* Copse, Edmondsham, and near Cranborne. Broadstone. Branksome Park.—*B. piperatus* Bull. Goathorn Plantation and Luckford Copse, Purbeck, *C. B. G.*—*B. bovinus* L. Fitzworth Heath; woods near Corfe Castle, and near Scotland Farm, *C. B. G.* Ferndown, *Mrs. Pringle.* Lower Mannington, *Mrs. Baker.* Branksome Park. Broadstone. Near Alderholt Station.—*B. granulatus* L. Uncommon. Kingston; Studland, *C. B. G.*—*B. edulis* Bull. Frequent. Woodland near Corfe Castle and Scotland Farm; Slape Heath; Trigon Park; between Wareham and Lytchett Minster, *C. B. G.* By Castle Hill, Cranborne. Woods, Edmondsham. Sutton Holms and Birches Copse. Maldry Wood, St. Giles.—*B. felleus* Bull. Rare. Plantation near Alderholt Station.—*B. laricinus* Berk. Norden, *C. B. G.* Two copses, Edmondsham. Plantation near Cranborne.—*B. scaber* Fr. Near Scotland Farm, and near Corfe Castle, *C. B. G.* Sutton Holms. Edmondsham. Alderholt.

Fistulina hepatica Fr. Said to be common in the New Forest. Witchampton, *Mrs. E. W. Baker.*

Polyporus rufescens Fr. Edmondsham Rectory garden.—*P. squamosus* Fr. Durlston; Studland, on elm; near Corfe Castle, on black poplar, *C. B. G.* Crichel, *Mrs. Baker.* St. Giles Park, on beech.—*P. sulphureus* Fr. On oak stump, Edmondsham. On a dying apple trunk, Longham.—*P. hispidus* Fr. On elm, Godlingston near Swanage, *C. B. G.*—*P. nidulans* Fr. Talbot Wood, Langton, *C. B. G.*—*P. mollis* Fr. Rare. Pine wood near Broadstone.—*P. betulinus* Fr. Furze Common Copse, Edmondsham.—*P. borealis* Fr. In the same wood as the last.—*P. adustus* Fr. Durlston; Ballard Down, *C. B. G.* Dead Man's Corner, Cranborne. Wood, Edmondsham. Birches Copse. St. Giles Park.—*P. amorphus* Fr. Rempstone, *C. B. G.* Ferndown, *Mrs. Pringle.* Plantation near Alderholt.—*P. cæsius* Fr. Rare. Pine wood, Broadstone.—*P. fragilis* Fr. Wood north of Fern-

down. Branksome Park.—*P. adiposus* B. & Br. Rare. Two woods, Edmondsham.

Fomes ulmarius Fr. Rare; Studland, *C. B. G.*—*F. fomentarius* Fr. Witchampton, *Mrs. Baker.*—*F. igniarius* Fr. On plum trees and a willow, Edmondsham.—*F. annosus* Fr. Woodland in and near Edmondsham. St. Giles. Ferndown. Branksome Park.—*F. applanatus* Wallr. Castle Hill, Cranborne. Edmondsham.—*F. ribis* Fr. On an old gooseberry bush, Edmondsham.—*F. ferruginosus* Mass. Edmondsham.

Polystictus cinnamomeus Sacc. Rare. Branksome Park.—*P. versicolor* Fr. Swanage; Durlston, *C. B. G.* Ferndown, *Mrs. Pringle.* Witchampton; Crichel, *Mrs. Baker.* Frequent in and near Edmondsham. Cranborne. St. Giles. Alderholt.—*P. hirsutus* Fr. Rare. Witchampton, *Mrs. Baker.*—*P. abietinus* (Dicks.) Fr. Rempstone; Corfe Castle, *C. B. G.* Lower Mannington, *Mrs. Baker.* Edmondsham. Broadstone. Branksome Park.

Poria vaporaria Fr. Rempstone; Arne, *C. B. G.* Several woods in Edmondsham. Sutton Holms. Ferndown.—*P. hibernica* B. & Br. Rare. Edmondsham.—*P. umbrina* Fr. Edmondsham.—*P. violacea* Fr. Ferndown.

Trametes gibbosa (Pers.) Fr. Near Scotland Farm, Purbeck, *C. B. G.* Cranborne, on beech. On Portugal laurel, Edmondsham.

Dædalia quercina Pers. Witchampton, *Mrs. Baker.* Woods in and near Edmondsham. St. Giles.—*D. unicolor* Fr. Sutton Holms, *W. R. Linton.*

Merulius lacrymans Fr. (Dry Rot.) Edmondsham. Shapwick Church, the late *Rev. R. P. Murray.*

Family 3. Hydneæ Fr.

Hydnum repandum L. Near Corfe Castle, *C. B. G.* Witchampton, *Mrs. Baker.* Martin Wood, *Miss V. Linton.* Alderholt. Edmondsham, and adjacent woods. St. Giles Park.—*H. ferrugineum* Fr. Rare. Edmondsham.—*H. auriscalpium* L. Plantations south of Cranborne, and east of Broadstone.—*H. niveum* Pers. Rare. On an elm stump, Edmondsham.

Tremellodon gelatinosum Pers. Copse, Edmondsham. St. Giles.

Irpex obliquus Fr. Copses in and near Edmondsham. St. Giles. Broadstone.

Phlebia merismoides Fr. Witchampton, *Mrs. Baker.* Edmondsham.

Grandinia granulosa Fr. Not common. St. Giles Park.

Odontia fimbriata Pers. Woodland, St. Giles Park.

Family 4. Thelephoreæ Fr.

Craterellus cornucopioides Berk. Witchampton, *Mrs. Baker.* Sutton Holms. Very fine in a copse, Edmondsham.

Thelephora terrestris Ehrh. Rare. Copse, Edmondsham. Branksome Park.—*T. laciniata* Pers. Colehill; Lower Manning-

ton, *Mrs. Baker.* Ferndown. West Moors. Alderholt.—*T. mollissima* Pers. Rare. Witchampton, *Mrs. Baker.*

Stereum hirsutum Fr. Common. Nine Barrow Down, *C. B. G.* Ferndown, *Mrs. Pringle.* Witchampton, *Mrs. Baker.* Branksome Park. Near Wimborne. Woods in and near Edmondsham. Cranborne.—*S. ochroleucum* Fr. Creech Hill Wood, St. Giles, *W. R. Linton.* Edmondsham. Sutton Holms and Birches Copse.—*S. purpureum* Fr. Swanage; Durlston, *C. B. G.* Edmondsham. Cranborne. St. Giles.—*S. rugosum* Fr. Near Corfe Castle, *C. B. G.* Two woods, Edmondsham.—*S. spadiceum* Fr. Plantation, Ferndown. Copses, Edmondsham.

Hymenochæte rubiginosa Lév. Near Ferndown. On two fences, Edmondsham.—*H. tabacina* Lév. Rare. In a single locality, Edmondsham.

Corticium sebaceum Mass. Rare. Woodland, Ferndown, *Mrs. Pringle.*—*C. lacteum* Fr. Rare. Copse south of Castle Hill.—*C. sambuci* Fr. Rare. Edmondsham to Cranborne.

Peniophora quercina Cooke. Castle Hill Wood, and another copse in Edmondsham.—*P. gigantea* Mass. Edmondsham. St. Giles Park. Branksome Park.—*P. ochracea* (Fr.) Mass. Three or four copses in or near Edmondsham. St. Giles Park.

Soppitiella sebacea Mass. Woodland, St. Giles Park.

Cyphella muscigena Fr. Edmondsham. St. Giles Park.

Family 5. Clavarieæ Corda.

Sparassis crispa (Wulf.) Fr. Plantation, Rempstone, *C. B. G.* Holt Wood, *Mrs. Baker.* Plantation, Alderholt.—*S. laminosa* Fr. Rare. Plantation north of Ferndown.

Clavaria fastigiata L. Herston quarries; in plenty on Peveril Down, Swanage, *C. B. G.*—*C. muscoides* L. Witchampton, *Mrs. Baker.* Edmondsham Park.—*C. cinerea* Bull. Lower Mannington; near Witchampton, *Mrs. Baker.*—*C. cristata* Holmsk. Goathorn Plantation, *C. B. G.* Two woods, Edmondsham.—*C. rugosa* Bull. Norden Plantation, *C. B. G.*—*C. abietina* Schum. Furze Common Copse, Edmondsham.—*C. flaccida* Fr. Uncommon. In a timber yard, Cranborne.—*C. fusiformis* Sow. Birches Copse, and in a copse, Edmondsham. Maldry Wood, St. Giles. Alderholt.—*C. inæqualis* Fl. Dan. Edmondsham Park. Near Castle Hill, Cranborne.—*C. vermicularis* Scop. Rare. Field on the south side of Edmondsham.—*C. fragilis* Holmsk. Ferndown, *Mrs. Pringle.* Edmondsham Park.—*C. ardenia* Sow. Rare. Very fine in Maldry Wood, St. Giles, with clubs over half an inch in breadth.

Calocera viscosa Fr. Ferndown, *Mrs. Pringle.* Branksome Park. Woodland, Castle Hill. Plantation south of Alderholt Station.

Typhula phacorrhiza Fr. In leaf-mould soil in a cool greenhouse, Edmondsham Rectory.

Family 6. Tremellineæ.

Auricularia mesenterica Fr. Witchampton, *Mrs. Baker.* Edmondsham, from two localities.—*A. lobata* Sommerf. Near

Whitecliffe Farm, Swanage, *C. B. G.* Withy Beds, Crichel, *Mrs. Baker.* Near Edmondsham House.

Hirneola auricula-judæ Berk. New Swanage; Durlston; Kingston woods, all on elder, *C. B. G.* Hinton Martel; Witchampton, *Mrs. Baker.* On elder trunks, Pentridge Down.

Exidia glandulosa Fr. Copse, Edmondsham, and in the Rectory Garden.—*E. albida* (Huds.) Brefeld. Witchampton, *Mrs. Baker.* Edmondsham Rectory Garden. Woodland, St. Giles Park.

Tremella mesenterica Retz. Studland; Nine Barrow Down; Durlston; Langton; Godlingstone Heath, *C. B. G.* Witchampton, *Mrs. Baker.* Broadstone. St. Giles Park and Maldry Wood. Edmondsham.—*T. viscosa* Berk. Near Edmondsham, *W. R. Linton.*

Dacryomyces deliquescens Duby. Branksome Park, *Mrs. Baker.* Copse, Edmondsham, *W. R. Linton*, where it is frequent on old wood railings. Near Broadstone. Plantation north of Ferndown.—*D. stillatus* Nees. Edmondsham. Birches Copse St. Giles Park. Near Broadstone. Branksome Park.

Order II. Pilacreæ.

A group of two species, not yet found in Dorset.

Order III. Gasteromycetes.

Family 1. Phalloideæ.

Ithyphallus impudicus Fr. Near Studland; Norden Plantation, *C. B. G.* Witchampton, *Mrs. Baker.* Woodland, St. Giles Park. Edmondsham once, perhaps imported from St. Giles.

Family 2. Nidulariaceæ.

Cyathus striatus Huds. Rare. Maldry Wood, St. Giles.

Sphærobolus stellatus Tode. Between Edmondsham and Sutton Holms.

Family 3. Lycoperdaceæ.

Geaster fornicatus Fr.—*G. lageniformis* Vitt.—*G. rubescens* Pers. All three found by Mrs. Baker in Witchampton; very rare; none of them recorded in Mr. Rayner's New Forest list.

Lycoperdon echinatum Pers. Norden Plantation, *C. B. G.*—*L. excipuliforme* Scop. Castle Hill Wood, Edmondsham.—*L. saccatum* Vahl. In one copse, Edmondsham.—*L. gemmatum* Batsch. Norden Plantation; Kingswood, *C. B. G.* Sutton Holms. Alderholt.—*L. pyriforme* Schaeff. New Swanage; Peveril Down; Bushey; near Chapman's Pool, *C. B. G.* Witchampton, *Mrs. Baker.* Two woods, Edmondsham. Maldry Wood, St. Giles.—*L. perlatum* Pers. Witchampton, *Mrs. Baker.* Plantation north of Ferndown. Sutton Holms. Three woods, Edmondsham. Woodland, Alderholt Park.—*L. hiemale* Bull. Downs north of Swanage; Studland; near two woods, Langton; Corfe Castle; Creech Down, *C. B. G.* Fields, Edmondsham. Castle Hill, Cranborne.—*L. cælatum* Bull. Near Studland; Swanage quarries; Bushey; Fitzworth Heath, *C. B. G.* Ed-

mondsham, and a field near.—*L. Bovista* L. Not common. Plantation south of Cranborne.

Family 4. Sclerodermeæ Fr.

Scleroderma vulgare Fr. Rempstone; Wareham; Lytchett Minster, *C. B. G.* Ferndown, *Mrs. Pringle.* Cole Hill, Wimborne. Mt. Pleasant, Horton. Sutton Holms. Two copses, Edmondsham.—*S. verrucosum* Pers. Witchampton, *Mrs. Baker.* Edmondsham. Castle Hill woodland, Cranborne.

Family 5. Hymenogastreæ.

Rhizopogon rubescens Tul. Not common. Ferndown, *Mrs. Pringle.* Colehill, near Wimborne.—*R. luteolus* Tul. Goathorn Plantation, *C. B. G.* Colehill, *Mrs. Baker.* Plantations of fir north of Ferndown, and south of Alderholt.

Order IV. Uredinales.

Melampsora euphorbiæ Cast. Garden, Edmondsham. Probably frequent.—*M. populina* Jacq. On dead poplar leaves, Edmondsham Rectory orchard.

Melampsoridium betulinum Kleb. On the under side of dying birch leaves, Edmondsham to Goatham.

Coleosporium senecionis Fr. On *Senecio vulgaris* L. Edmondsham Rectory garden.

Puccinia buxi DC. Box hedges, Edmondsham.—*P. chrysanthemi* Roze. On chrysanthemum leaves, Edmondsham Rectory. —*P. malvacearum* Mont. On *Malva sylvestris* L., East Creech Farm, Langton, *C. B. G.* On hollyhock, Edmondsham. — *P. primulæ* DC. On moribund leaves of *Primula*, in a greenhouse, Edmondsham.—*P. pruni* Pers. On leaves of plum and damson while still green, Edmondsham Rectory.—*P. thesii* Chaill. Downs above the lighthouse, Swanage, *C. B. G. & R. V. Sherring.*

Phragmidium violaceum Schultz. On the under side of bramble leaves, Goatham and Sutton Holms. — *P. subcorticatum* Schrk. On wild rose leaves, Edmondsham.

Order V. Ustilaginales.

Ustilago avenæ Jens. On oats, Romford Farm, Edmondsham.

Melanotænium endogenum De Bary. On *Galium*, near Swanage, *R. V. Sherring.*

Class II. ASCOMYCETES.

Order I. Gymnoascaceæ.

Ascomyces deformans Berk. (Curl or Peach-curl.) On the under side of peach and nectarine leaves. Edmondsham, gardens.

Order II. Pyrenomycetes.

Cordiceps militaris (L.) Link. Holt Wood, *Mrs. Baker.* Copse, Edmondsham.

Epichloe typhina Tul. Edmondsham.

Nectria cinnabarina (Tode) Fr. Edmondsham Rectory garden;

near Edmondsham Church, on hornbeam.—*N. coccinea* (Pers.) Fr. Edmondsham Rectory grounds. — *N. ditissima* Tul. On apple branches, Edmondsham Rectory orchard.—*N. peziza* (Tode) Fr. On logs by Edmondsham House.

Xylaria polymorpha (Pers.) Grev. Kingston woodland, *C. B. G.* Woodland, St. Giles Park. — *X. hypoxylon* (L.) Grev. Lower Mannington, *Mrs. Baker.* On a paling, near Wimborne. Very common on stumps, damp posts, &c., in Edmondsham. Maldry Wood, St. Giles.

Hypoxylon fuscum (Pers.) Fr. Quince Hill Wood; near Creech, *C. B. G.*—*H. multiforme* Fr. Rempstone Wood, *C. B. G.* Edmondsham and Romford. St. Giles Park.

Diatrypella quercina (Pers.) Nitschke. Copses, Edmondsham. Woodland, St. Giles Park.

Diatrype disciformis (Hoffm.) Fr. Rempstone Wood, *C. B. G.*

Sphærella maculiformis Awd. On dead leaves of *Æsculus*, in in a copse, Edmondsham.

Daldinia concentrica Bolt. Encombe woodland, on dead ash, *C. B. G.* Withy Beds, Crichel; Lower Mannington, *Mrs. Baker.* In a hollow oak stump, and on ash, Edmondsham.

Uncinula aceris Sacc. On maple leaves, Edmondsham. On sycamore leaves, St. Giles Park.

Erysiphe polygoni DC. On turnip, Edmondsham Rectory.

Dichæna quercina Pers. Woodland, St. Giles Park.

Massaria inquinans Tode. Edmondsham.

Order III. Discomycetes.

Trochila ilicis Crouan. Creech Hill Wood; Studland Wood, *C. B. G.* Ferndown, *Mrs. Pringle.* Sutton Holms. Three or four copses in Edmondsham.—*T. lauro-cerasi* Fr. On dead laurel leaves, Edmondsham Rectory garden.

Rhytisma acerinum Fr. On freshly fallen leaves of maple and sycamore. Cranborne. Woodland, St. Giles Park.

Bulgaria polymorpha Wettstein. Witchampton, *Mrs. Baker.* On oak logs, Rhymes, and in the timber yard at Edmondsham House, abundant.

Coryne sarcoides Tul. Edmondsham. Cranborne.

Mollisia cinerea Karst. On dead wood, Edmondsham.

Helotium claro-flavum Berk. Woodland, St. Giles Park. On decayed mistletoe branches, Edmondsham Rectory orchard.—*H. virgultorum* Karst. var. *fructigenum* Rehm. Castle Hill Wood, Edmondsham.

Sclerotinia tuberosa Fuckel. Named for me by Mr. F. J. Rayner, as a form; Edmondsham.

Chlorosplenium æruginosum De Not. Frequent on dead oak branches in one copse, Edmondsham.

Lachnea hemispherica Gillet. Uncommon. Witchampton, *Mrs. Baker.* In one copse, Edmondsham.

Dasyscypha virginea Fckl. Copse in Edmondsham near Castle Hill.—*D. calycina* Fckl. Copse, Edmondsham, *W. R. Linton.* Pine wood near Broadstone.

Geopyxis coccinea Mass. Rempstone Heath, *C. B. G.* Near Corfe Castle, *E. R. Bankes.* Edmondsham Rectory orchard. Hedge-bank of Castle Hill Wood. Woodland, St. Giles Park.

Humaria granulata Sacc. Fields in Edmondsham. No doubt common elsewhere.

Peziza vesiculosa Bull. Gardens, Swanage, *C. B. G.*—*P. sepiatra* Cooke. Witchampton, *Mrs. Baker.*—*P. venosa* Pers. Withy Beds, Crichel, *Mrs. Baker.*—*P. ampliata* Pers. On the damp thatching of an old haystack, *Capt. E. C. Linton.*—*P. badia* Pers. Ferndown, *Mrs. Pringle.*

Otidea leporina Fuckel. Norden Plantation, *C. B. G.* On the ground in Holt Wood, *Mrs. Baker.*—*O. aurantia* Mass. Swanage, *C. B. G.* Witchampton, *Mrs. Baker.* Rhymes Copse, Edmondsham.—*O. luteo-nitens* Mass. Pine wood north of Ferndown.

Helvella crispa Fr. Rempstone; Norden; Kingswood, *C. B. G.* Ferndown, *Mrs. Pringle.* Witchampton, *Mrs. Baker.* Edmondsham. Woodland belt on two sides of St. Giles Park.—*H. lacunosa* Afzel. Woodland, St. Giles Park. Plantation south of Cranborne.

Leotia lubrica Pers. On the ground in woodland, Sutton Holms.

Spathularia clavata Sacc. Among pine leaves on the ground, Cranborne.

Geoglossum glutinosum Pers. In grass south of Ferndown, *Mrs. Pringle.* Edmondsham Park.

Class III. PHYCOMYCETES.

Phytophthora infestans De Bary. (Potato disease.) No notes made, but a frequent destructive plague on potato in wet seasons, too well known.

Class IV. DEUTEROMYCETES.

Family 1. Mucedineæ Link.

Monilia fructigena Pers. A mould growing on decayed apples, Edmondsham; probably very common everywhere.

Oidium alphitoides Griff. et Maub. On living oak leaves, Edmondsham to Goatham.

Aspergillus glaucus Link. On fruit and leaves, Edmondsham Rectory garden.—*A. flavus* Link. On herbarium specimens, Edmondsham Rectory.

Botrytis cinerea Pers. Frequent in the greenhouse, Edmondsham, on dead leaves of passion-flower, geraniums, &c., flowers and decaying fruit.

Sepedonium chrysospermum Fr. Growing on *Boletus* in two copses, Edmondsham.

Trichothecium roseum Link. On bark in Edmondsham Rectory orchard, and in a copse.

Macrosporium tomato Cke. Forming dark patches on tomatoes when maturing in wet seasons, Edmondsham Rectory garden.

Septoria euonymi-japonicæ Pass. Discovered by Mr. C. B.

Green at Durlston, near Swanage, on fallen leaves of *Euonymus japonica*; named for him by Mr. J. F. Rayner and reported as new to Britain.

Family 2. Tuberculariæ Ehrenb.

Tubercularia vulgaris Tode, conidial state of *Nectria cinnabarina*. Cranborne. Edmondsham. Plantation north of Ferndown.

MYCETOZOA De Bary (Myxomycetes Wallroth).

Subclass Endosporeæ.

Badhamia capsulifera Berk. Not common. In a crevice between bark and wood of a decayed branch, Edmondsham.—*B. utricularis* Berk. On *Stereum ochroleucum*, Edmondsham.—*B. panicea* Rost. On a piece of elm from an Edmondsham wood.

Leocarpus fragilis (Dicks.) Rost. (*L. vernicosus* Link). On dead leaves, Witchampton, *Mrs. Baker*. Fir plantation, Broadstone.

Didymium difforme Duby. On dead leaves, Edmondsham.—*D. squamulosum* Fr. On dead wood, Edmondsham Rectory grounds.

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TWO NEW SPECIES OF MYRIANTHUS.

By A. B. Rendle, D.Sc., F.R.S.

Myrianthus is a genus of *Moraceæ*, containing according to present knowledge about ten species, all of which are confined to tropical Africa; *M. arboreus* Beauv. spreads across the continent, the others apparently occupy more restricted areas.

The study of the species from the herbarium material available presents considerable difficulty, as the plants are dicœcious trees, and five of the eight previously described species are known only from the male plant. Moreover, the leaf-form shows considerable variation even in one and the same species; the primitive form was evidently simple.

The most general type of leaf is palmately compound with five to seven elliptical or oblanceolate leaflets with a pointed apex and generally sharply toothed margin, the leaflets are sessile or shortly stalked, but the main petiole is generally long. This type is so far as known the only one found in the adult plant of *M. arboreus* Beauv., and the few closely allied species which with it form the section *Eumyrianthus*. But the leaves of the seedling, as shown by specimens of *M. arboreus* collected by Welwitsch in Angola, are simple, and ovate-elliptical to elliptical in shape, with the characteristic toothed margin, and on the under face the dense short whitish tomentum between the prominent venation, which is also a feature of the adult leaf throughout the genus. These seedling leaves resemble in fact the adult form characteristic of *M. serratus* Benth. & Hook. f., the type of the genus *Dicranostachys* of Trécul, which is, however, better regarded as a section of *Myrianthus*. In *M. serratus* the leaves are also trilobed, and a similar variation occurs in the allied species *M. cuneifolius* Engl., where the leaves in female specimens are deeply 3–5-lobed.

In the eastern species of the same section, *M. Holstii* Engl., which has been confused with *arboreus*, the leaves vary from a more or less deeply 3- or 5-lobed form to a completely palmately compound leaf with 5 or 7 leaflets. In *M. libericus*, described below, which is only known from male specimens, the leaf shows both the simple and trifid form, and resembles in this respect

M. serratus. In *M. Talbotii*, a new species which has been sent by Mr. and Mrs. P. Amaury Talbot from several localities in Southern Nigeria, we know only the most highly developed leaf-form, the leaves having 5 to 8 distinctly stalked leaflets.

The two species described below are both included in the section *Dicranostachys*, though in the case of *M. libericus*, female specimens, on which depends the distinction between the sections, are unknown. The species is, however, evidently closely allied to *M. serratus*.

Myrianthus libericus, sp. nov. *Frutex* ramulis juvenilibus, petiolis et inflorescentia pubescentibus, pilis cinereo-brunneis. *Folia* petiolata, membranacea, late oblongo-elliptica vel trifida (segmento mediano quam lateralibus multo majore, elliptico-oblongo), apice abrupte acuminata, basi obtusa, margine inæqualiter argute dentata, c. 3 dm. longa, 1 dm. lata, in facie superiore sparse pilosa, subter inter venulas prominentes breviter albido-tcmentosa; nervis lateralibus utrinque circa 10, valde ascendentibus, veluti costa mediana in facie inferiore prominentibus; petiolus quam lamina duplo minor. *Stipulæ* dense sericeæ, ·5 cm. longæ. *Inflorescentiæ* masculæ in axillis geminæ, c. 6·5 cm. latæ, pedunculo 5–7 cm. longo, vix 2 mm. crasso, in ramis 3–4 tenuibus dichotomis soluto, floribus in glomerulis subglobosis vel oblongis 4–6 mm. longis, interdum basi confluentibus, in ramulis 5^{ti} vel 6^{ti} ordinis congestis; bracteolis quam perianthio angustioribus, concavis, superne ciliolatis. *Perianthium* ad basin 4-sectum, segmentis apice latioribus, obtusis, crassiusculis et concavis, dorso ciliolatis, usque ad basin angustatis. *Stamina* 3–4, filamentis connatis. Planta femina haud cognita.

Hab. Liberia, Mt. Barclay, *R. H. Bunting*! in Herb. Mus. Brit. Sierra Leone, *Unwin & Smythe*, 2! in Herb. Kew.

Allied to the two West African species, *M. serratus* and *M. cuneifolius*, which it resembles in leaf characters, but is distinguished by the larger male inflorescence with slender branches and small more or less distinct clusters of flowers on the ultimate branchlets.

Myrianthus Talbotii, sp. nov. *Arbor* (?) ramulis juvenilibus veluti petiolo pilis albidis appressis indutis, internodiis teretibus, cavis. *Folia* digitata foliolis 5–8, petiolulatis, siccis membranaceis, late oblanceolatis vel oblongo-ellipticis, apice argute acuminatis, basi acuto in petiolulum angustatis, margine plus minus argute dentatis, cum petiolulo 1·2–2·5 cm. longo 2–4·5 dm. longis 7·5–12·5 cm. latis, foliolis lateralibus multo minoribus, in facie superiore lucentibus, subter inter venulas conspicuas breviter albido-tomentosis costa mediana et nervis lateralibus plurimis ascendentibus in facie inferiore prominentibus; petiolus sulcis pluribus lineatus, folio subæquans. *Stipulæ* late ovatæ, acuminatæ, dense sericeæ, c. 1·5 cm. longæ. *Inflorescentiæ* in axillis geminæ; masculæ usque ad 2·25 dm. latæ, pedunculo 17 cm. longo et 4 mm. crasso, bracteis caducis, ramis 4–5, dichotome ramosis, ramulis ultimis et penultimis brevibus ubique floriferis, 4–8 mm. longis, 2 mm. crassis, bracteolis late spathulatis, dorso superne

ciliolatis, quam perianthio brevioribus. *Perianthii* segmenta 4, pæne ad basin libera, obovata, superne latiora et concava, vix 2 mm. longa. *Stamina* 3–4, libera, perianthium æquantia. *Flores* femineæ circa 20 in caput globosum 1·25–2 cm. diam., pedunculo 1·5–3 cm. longo, bracteolis anguste oblongis vel oblanceolatis basi angustatis, dorso pubescentibus, 2 mm. longis. *Perianthium* anguste ovoideum, 5–6 mm. longum, hirtellum, ad orem angustatum, stigmate lineari-lanceolato exserto. *Fructus* ovoidei 4–10, in capite 4–5 cm. diam. connati, perianthio carnoso et apice rostrato inclusi.

Hab. South Nigeria, Oban and Eket districts, *Mr. and Mrs. P. A. Talbot*! Cameroons, Bipinde, *Zenker*, 1100! (with immature male flowers only). Herb. Mus. Brit., Herb. Kew.

Distinguished from the other members of the section *Dicranostachys* by the compound leaves with 5–8 leaflets, and the ovoid but compressed strongly beaked fruit.

CORRECT NAME FOR ATRIPLEX ARENARIA Woods.

By S. F. Blake, A.M.

When recording recently from North America* the Sea Blite which has generally passed in British literature as *Atriplex arenaria* Woods, I had occasion to look critically into the name which this species should bear in accordance with the International Code of Nomenclature. Woods's name (Phytol. iii. 593 (1849)) is unavailable because of the earlier and valid *A. arenaria* Nutt. (Gen. i. 198 (1818)), an American species of the section *Obione*, which has sometimes been considered a genus, but is now by a general consensus of opinion referred to *Atriplex*. The plant first distinguished by Woods was apparently a minor constituent of the original *Atriplex laciniata* of Linnæus. In the *Cambridge British Flora* (ii. 179, t. 185 (1914)) Dr. Moss and Mr. Wilmott have adopted for it the name *A. sabulosa* Rouy (Bull. Soc. Bot. Fr. xxxvii. p. xx (1890)), and refer to it as a straight synonym *A. maritima* L. (Fl. Angl. 25 (1754)), based on Ray's "Atriplex maritima J. B." (Syn. ed. 3, 152 (1724)); the latter binomial (i. e. *A. maritima* L.) they consider to have been adopted by Linnæus from Ray by a *lapsus calami*, and accordingly discard. If the case were really as simple as this, and *A. maritima* L. based solely on British records of *A. arenaria* Woods, it would certainly be best to adopt the Linnæan name, whether it be a *lapsus calami* or not, and thus avoid the complications that arise if the name be disregarded; but since Ray's species was based not only on British records referable to *A. arenaria* Woods, but also on Continental ones certainly appertaining to *A. laciniata* L. as now taken, the name *A. maritima* L. must be considered to cover both; that is, it is merely a *nomen abortivum*, to be referred to the synonymy of *A. laciniata* sensu L.

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* *Rhodora*, xvii. 83–86, f. 1–2 (1915).

The first author after Woods clearly to distinguish and name the plant was E. Hallier, who, in 1863, in a revision of the Atriplices of Heligoland, published it as a new species, *A. maritimum* (Bot. Zeit. xxi. Beilag. [No. 1] 10). Linnæus's *A. maritima*, as just noted, is a pure synonym of *A. laciniata* L.; *A. maritima* (L.) Crantz (Inst. i. 208 (1766)) is *Suæda maritima* (L.) Dumortier; and *A. maritima* Pall. (Reise, ii. 289 (1773)) is merely a nomen. All these uses of the name being invalid, it is clear that by the provisions of the International Code the name to be employed for the plant is ATRIPLEX MARITIMA E. Hallier. The species is one of a number whose range, chiefly on the coast of northwestern Europe, includes also the eastern coast of Canada. *A. maritima* is found in America in New Brunswick, Prince Edward Island, and the Magdalen Islands, the earliest American specimen I have seen being one in the British Museum collected by John Macoun on Prince Edward Island in 1888.

NOTE ON ARTICLE 45 OF THE VIENNA CODE.

By G. CLARIDGE DRUCE, M.A.

THE suggested alteration in the names of the Sea Lavenders (*Limonium*) and Thrifts (*Statice*), and the displacement of the earlier names of *Castalia* and *Nymphæa* for the more recent *Nymphæa* and *Nuphar*, led me to look closely into the wording of the above-named Article. I fail to find that, if carefully read, and bearing in mind the earlier sentences, such a change as that involved in the substitution of the much later *Armeria* for *Statice* is necessitated.

Article 45 reads:—"When a genus is divided into two or more genera, the name must be kept and given to one of the principal divisions. If the genus contains a section or some other division, which, judging by its name or its species, is the type or the origin of the group, the name is reserved for that part of it. If there is no such section or subdivision, but one of the parts detached contains a great many more species than the others, the name is reserved for that part of it." This rule has been recently construed by M. Briquet* to demand the use of *Nymphæa* vice *Castalia*, and the consequent restoration of Smith's *Nuphar* of much later date than Salisbury's *Castalia*. In this instance the Linnean genus consists of four species, one of which is a *Nelumbium*, two are white, and the other a yellow water-lily—the latter stands first in the *Species Plantarum*. In his *Genera Plantarum* (1754), p. 227, Linnæus has three sections, *N. lutea*, *N. alba*, and *Nelumbo*, so when Salisbury in 1805 separated the two white-flowered species as *Castalia* (*Nelumbo* having been previously separated by Adanson in 1763), he left the first section to bear the name *Nymphæa*. It was not until three years later, and for quite other reasons, Smith renamed the yellow lily *Nuphar*,

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* See Journ. Bot. 1911, 277.

which it is now proposed to use, on the ground of the numerical superiority of the white water-lilies, which, however, at the time of separation, had one more species than the yellow. So, too, with the Linnean genus *Statice*, in which Linnæus wrongly included two such distinct genera as the Thrifts and Sea Lavenders. Miller (Gard. Dict. Abridg. 1754) first, and then Hill (Brit. Herbal, 1756), more accurately separated the Sea Lavenders under the Tournefortian name *Limonium*, by which they had long been widely known, notwithstanding they were more numerous than the Thrifts, which these authors, I think rightly, left to bear the name *Statice*. In 1809, however, Willdenow gave the name *Armeria* to the Thrifts, a name which some authors wish to retain, even if *Statice* has to disappear. *Armeria* is practically the Tournefortian genus *Statice*; is not the conservation of *Limonium*, therefore, according to Article 45—"when a genus is divided the name must be kept and given to one of the principal divisions"? The Thrift is the first species in the Sp. Pl., and also in the *Genera* (p. 135), where (in Obs.) Linnæus says, "*Statice* auctorum calyce communi triplici, florem subrotundum componit," and "*Limonium* auctorum calyci communi imbricato flosculis serie oblonga exhibit."

Moreover, another sentence of Article 45 bears out this reading—"If the genus contains a section or some other division, which, judging by its name or its species, is the type or origin of the group, the name is reserved for that part of it." *Limonium* had long been the name of the Sea Lavenders, and *Statice* of the Thrifts, so not only is the historic sequence maintained, but the law of priority is followed, by applying to these two genera their Tournefortian names, which had been revived by Miller. I therefore contend, as I did in Journ. Linn. Soc. 1900, 68–77, that we should use *Limonium* to designate the Sea Lavenders, and *Statice* instead of *Armeria* for the Thrifts.

Nomenclaturists who have been induced to adopt a numerical proportion as a standard for generic names have not, it would appear, sufficiently realised what the logical effects of such a course would demand. If on this ground we give up *Limonium* and *Castalia*, are other similar cases to remain untouched? The genus *Fumaria* consists of eleven species, only three of which are *Fumariæ*, indeed *F. spicata* is put by some authors into a separate genus, *Platycapnos*; one is a *Sarcocapnos*; two in the *Index Kewensis* are placed as *Dicentra*; while five belong to *Corydalis*. Even if the section "corollis bicalcaratis" with two species of *Dicentra* are removed, we still have five *Corydalis* against three *Fumaria*. The genus *Cistus*, as defined by Linnæus, combined two Tournefortian genera, *Cistus* and *Helianthemum*, and had thirty-seven species. Miller (*l. c.* 1754) took out twenty-six species to form the genus *Helianthemum*, leaving only eleven to bear the name *Cistus*, notwithstanding its numerical inferiority, which is still maintained, Uphof (Die Pflanzengatt.) giving *Cistus* thirty, and *Helianthemum* one hundred and thirty-five species. It may be held that the first section "exstipulatæ fruticosæ" of thirteen

species, most of which are true *Cistus*, was meant to bear that name, since it also conserves that of Tournefort; but this is precisely analogous to the case of *Statice*. The genus *Geranium* affords another example: *Pelargonium*, which with *Erodium*, was separated by L'Héritier in 1787, contains a larger number of species than was left in *Geranium*, and this proportion is still maintained. *Chelidonium* L. consists of four species: Miller (1754) separated *Glaucium*, thus taking out *C. corniculatum* and *C. flavum*, leaving *Chelidonium majus* and the plant afterwards named *Rœmeria hybrida*. There are now about twenty species in *Glaucium* and two in *Chelidonium*: are, then, all the species of *Glaucium* to be named *Chelidonium*? There is a stronger example in the Linnean genus, if such it can be called, *Cheiranthus*, which has thirteen species; these consist (using the names of the *Index Kewensis*) of five species of *Malcolmia*, five (now four) of *Matthiola*, one *Erysimum*, and only two of the modern *Cheiranthus*. Shall, therefore, upwards of thirty species of *Cheiranthus* be called *Cheiri*, and more than forty species of *Malcolmia* be named *Cheiranthus*? *Antirrhinum*, into which Linnæus wrongly merged *Linaria*, had about forty species; three only of these belong to *Antirrhinum*, one is an *Anarrhinum*, one *Nemesia*, and thirty-four are *Linaria*. Miller (*l. c.*) separated the Tournefortian *Linaria* as a distinct genus, notwithstanding its very great numerical proportion, and retained its original name. The present proportion, according to Uphof, is *Antirrhinum*, thirty; *Linaria*, one hundred and sixty. *Andromeda* (which may be compared with *Nymphæa*) has nine species; when Don removed two species each of *Leucothoe* and *Cassiope*, he left only one—the old genus *Polifolia*—to bear the name *Andromeda*. *Myagrum* had nine species, five of which are *Rapistrum*, and *Myagrum*, *Vogelia*, *Cochlearia*, and *Camelina* have each a single species. Are all the species of *Rapistrum* to be changed to *Myagrum*? The genus *Carduus* (the sections of which are unimportant) consists of twenty-six species (*C. Acarna* of ed. 1 is in ed. 2 transferred to *Cnicus*). Of these twenty-six species, five only are unplumed thistles, i. e. *C. nutans*, *C. acanthoides*, and *C. crispus* (which most authors unite), *C. pycnocephalus* and *C. defloratus* (which are not in the 1753 edition), while there are fifteen species of plumed thistles (*Cirsium*). The six remaining species belong to five different genera:—*Tyrimnus*, *Mariana*, *Notobasis*, *Serratula*, two being *Jurineæ*.

Other examples need not be given; enough has been brought forward to show the danger of pressing the question of numerical proportion so far as existing genera are concerned. The Article is a rule which must be borne in mind when a genus in the future is subdivided, but its retrospective action is better honoured in the breach than the observance, since any supposed advantages of strictly applying the principle would, if it were strictly and logically followed, produce enormous changes, or add very largely to the already too long and arbitrary list of "nomina conservanda."

In what one fears will be a distant future, when an Inter-

national Congress can again be brought together, it might be well to add a rider to Article 45 (thus making its meaning unambiguous) to the effect that the rule only applies to future divisions of genera or groups, and has no retrospective action; and that, as with the definition of species, so too with genera, the rule of priority shall be enforced. At present Article 45, at any rate in the English version, has led to some misunderstanding, and may lead to unneccessary disturbances in nomenclature.

DIALYSIS OF COROLLA IN CONVOLVULUS ARVENSIS.

By G. S. Boulger, F.L.S.

In September Mr. G. D. Willis, of Basingstoke, Hants, sent me a specimen of *Convolvulus arvensis* L. from that neighbourhood, in which the corolla is deeply five-cleft. The plant is on the whole smaller in its parts than the typical form; its leaves oblong, subacute, and slightly hastate; and the corolla white. Mr. Willis writes that this form occurs along some twenty to twenty-five yards of hedgerow, where he has known it for at least five years, and where it has had this year to withstand the vicissitudes of a military camp. As the species is perennial, this does not prove that this form is true to seed.

On endeavouring to trace previous notices of such a variation, with the help of Penzig's *Pflanzen-teratologie* (1890), I find that the earliest is apparently that in Dillenius's edition of Ray's *Synopsis* (p. 276), where we read: "Convolvulus flore minimo, ad unguem fere secto. Prope Maidstone invenit D. Rand." *

This record is quoted by Smith (*English Flora*, i. 285) without any statement that he had himself found such a plant. Nevertheless, Thomas Hopkirk, in his *Flora Anomoia* (1817), p. 136, writes: "The natural divisions of the corolla are in some instances increased in depth, as in . . . the variety of the Small Bindweed (*Convolvulus arvensis*) mentioned by Ray, and since found by Sir Edward Smith, the corolla is deeply divided into five segments."

George Engelmann, in his *De Antholysi Prodromus* (1832), pp. 40–41, says, under the heading "Disjunctio petalorum gamomerium": "Hæc antholysis forma non frequenter occurrit; quam vidi in *Anagallide* virescente; in *Orobanche* Schimper animadvertit. Nominantur ab auctoribus *Solanum tuberosum*, *Convolvulus arvensis*" . . . He refers to Hopkirk, and mentions four or five other plants varying in a similar manner.

In 1838 M. De la Font, Baron de Melicocq, published "Notes sur la végétation des environs de Laon . . . et sur quelques varietés ou monstruosités observées dans cette contrée" (*Annales des Sciences Naturelles*, 2nd ser. vol. ix. (Botanique) p. 380). He writes: "*Convolvulus arvensis* L. v. *β corollis profondè quinque-*

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* Isaac Rand, an apothecary in the Haymarket, became in the year Dillenius's book was published (1724) "Præfectus" at the Chelsea garden.

partitis Nobis. Cette variété n'a jamais été observée. Les corolles ont cinq lobes très étroits qui arrivent près de la base, sans y atteindre néanmoins. Quelques-unes d'entre elles ort un stigmate à trois lobes et non à deux, comme dans le Liseron des champs. Trouvée à Anteny, avec l'espèce."

A. Malbranche, writing from Rouen in September, 1859, to the Société Botanique de France (Bull. de la Soc. Bot. vol. vi. (Paris), 1859, p. 719), says: "J'ai trouvé à Lormont (Gironde), le 15 août, dans une herborisation faite en compagnie de MM. Clos, de Rochbrune et L. Motelay, le *Convolvulus arvensis* L. à fleurs quinqué-fides, régulières, partagées presque jusqu'à la base."

In his *Vegetable Teratology*, published in 1869 (pp. 72–3), Dr. Maxwell Masters writes, under the heading "Dialysis of the Corolla": "The following list contains the names of the genera in which this separation of the petals of an ordinarily gamopetalous flower takes place most frequently." He then gives a list of twenty-six genera, seventeen of which have the ! that indicates the author's personal observation; among these latter are *Convolvulus* and *Pharbitis*.

In 1877 R. Caspary exhibited some specimens of what is apparently the same thing at Königsberg (*Schriften der Physikalisch-œkonomischen Gesellschaft zu Königsberg*, xviii. I. pp. 95–6). They were found, he says, in July, 1876, by Herr Hammer, a schoolmaster, in a field near the coast at Rothenen, near Fischhausen. The margin of the corolla he describes as being divided into five "free parts, about 12 mm. long and linear-lanceolate"; and he continues: "This dialysis of the corolla in *Convolvulus arvensis* appears not to have been hitherto noticed. Masters, it is true, includes *Convolvulus* among the genera in which it has been observed, but does not name any species; and the case of *Convolvulus* was unknown to Alexander Braun, who had so wide a knowledge of such morphological variations."

Under date July 11, 1886, Freiherr von Spiessen communicates to the Deutschen Botanischen Gesellschaft (*Berichte*, iv. Berlin, 1886, p. 258), a description of "a peculiar variety of the Field Bindweed, *Convolvulus arvensis* L. var. corolla quinquepartita," which does not seem altogether identical with those we have as yet mentioned. He writes: "The Field Bindweed, well known as one of the commonest weeds, has a well-developed funnel-shaped corolla, which, as seen from below, is white or whitish-rose colour, with five deeper-coloured stripes. Here, in the neighbourhood of the vineyards on the boundary between Mittelheim and Winkel, in Rheingau, a variety occurs in one spot, but in some plenty, in which the lighter parts are entirely absent so that the corolla presents a star-like form. The corolla is snow-white and deeply divided, being only united at its base where the calyx springs. On the five divisions of the corolla there are usually little projections or appendages. With the exception that its flowers are generally smaller, the plant is otherwise quite like the type of the species in leaf, growth, &c. At the first glance, the flower is very like that of *Ornithogalum umbellatum* L."

To this description Ernst Hallier, of Stuttgart, made the following interesting additions (Deutsche Bot. Monatsschrift, October, 1888, p. 154):—

"In the summer of 1887 I found a single example of this form in a vineyard at Stuttgart. In this summer (1888) I was fortunate enough, in company with my son, Emil Hallier, to find four more examples at the same place. I have planted two in pots for further observation. The name 'quinquepartita' does not apply to these specimens, since the corolla is often sex-partite. I propose, therefore, to designate it 'var. corolla partita.' In the forthcoming Flora of Stuttgart by O. Kirchner this form is not mentioned, although I made known its occurrence in this vineyard last summer. I find that the stamens and pistils are of equal length, and that each of the divisions of the corolla bears on either side at its base a small bluntly triangular projection. The flower is pure white, without any marking.

"I must further remark that all possible gradations between this form and the type occur, even on one and the same plant. Stuttgart is extremely rich in forms of this species. The colour may be pure white or entirely rose-colour or cherry-red without any marking, or alternating with the five white stripes there may be five wider or narrower bands of the ground-colour widening outwards. The ground of the corolla is either greenish or uniformly coloured. The margin of the corolla is often entire, or it may have five little projections or may not uncommonly be produced into five long points. The size of the flower is also very variable. It would be a useful undertaking for any florist to collect all these forms and deal with them critically."

Freiherr von Spiessen's description of the Rheingau variety in which parts appear to be suppressed ("völlig verschwunden") hardly tallies with the Basingstoke form, in which the segments overlap much as in the flower of a *Cyclamen* in which the spiral twist is absent. The little projections on the segments of the dialysed corolla recall those on the semi-bipinnatifid fronds of the Welsh Polypody, or—to speak rather of floral organs—again those processes common in *Cyclamen* which have culminated in median fringes. Hallier's paired triangular projections at the base of the corolla-lobes suggest the auricles of the sub-hastate leaves. As to the great variability which he ascribes to the species near Stuttgart, I think that, while everyone must have noticed the great variety in colour, paralleling in apparent causelessness that of *Cardamine pratensis* L., the differences in form have not been previously much noticed. Hallier seems to have no doubt as to the identity of his Stuttgart form with von Spiessen's from the Rheingau; whilst there is nothing in the descriptions to distinguish any of the other specimens from one another or from the Basingstoke form. I may add that until Mr. Willis's specimens arrived there was no such form represented in the National Herbarium.

Of course Hallier's remarks make it more than ever doubtful whether such a form should be given a distinctive name. Baron

de Melicocq's "corollis profonde quinque-partitis," and Hallier's "corolla partita," are alike descriptions and not names. If it should be worth while to give the form a varietal name, none could be more appropriate than *schizopetala*, which I proposed for a similar variation in *Erica cinerea* L. (*Journal of Botany*, 1912, p. 315). It may be characterized as follows:—

Planta omnino parvior quam forma typica; foliis oblongis, subacutis, paullum hastatis; floribus albis; corollis ad basim fere sectis. Basingstoke, Hants; communicavit Dom. G. W. Willis, Septemb. 1915, qui varietatem per quinque annos observavit, teste litteris suis.

A NEW SALICORNIA VARIETY AND HYBRID.

By the Rev. E. S. Marshall, M.A., F.L.S.

1. Salicornia disarticulata Moss, n. var. humifusa.—Flores, ut in typo, semper solitarii; segmenta in autumno valde disarticulantia. Habitu multum differt; solo arcte appressa, plus minus triangulari-flabellata, fructificans rubella vel rubra. Spicæ crassiores, plerumque (sæpe duplo, interdum triplo) longiores.

Flowers, as in the type, always solitary; segments shedding freely in autumn. It differs much in habit: closely appressed to the ground, more or less triangular-fanshaped, reddish or red, when in fruit. Spikes stouter, usually longer (often twice, sometimes thrice).

Exsiccata.—Herb. Marshall, No. 4212.

Abundant on sandy mud, near high-water mark, in several parts of Dawlish Warren, v.-c. 3 S. Devon, Sept. 21, 28, Oct. 7, 1915.

A very striking plant, recalling *S. appressa* Dumort. in general appearance, but at once distinguishable by its single flowers. It varies much in luxuriance; some specimens attain a length of eight inches, and are six inches across. The prevailing colour, in late September and October, is brick-red; but it is often much deeper (crimson or blood-red). In this locality the type (new for Devon) is very scarce, and apparently always erect; even in early October it remains light green or yellowish, except that the flowers are reddish brown.

Dr. Moss, who has not yet seen specimens, writes:—"The prostrate form of *Salicornia disarticulata* I have seen in Brittany (locally common) and in England (rare). I *suspect* the first stem is killed—eaten by animals or trodden down: if so, the branches left would naturally have smaller spikes. I attach little or no importance to colour of glass-worts. I doubt if it is worth naming, except perhaps as a *forma*." However, in the present instance, the very numerous individuals observed (many hundreds, if not thousands) were certainly uninjured; on an average the spikes are also considerably thicker, and often much longer, though in the latter respect there is great variation—some of them attain a length of 2 cm. The plants are frequently small, but as a rule larger than in the type. My No. 273 from New

Romney, 15 East Kent, Sept. 17, 1891, is probably what Dr. Moss has seen; it was prostrate, and sometimes triangular-fanshaped, but had the green hue and short spikes (seldom as much as 1 cm. long) of the normal plant. This was issued as *S. appressa* Dumort.

2. S. DISARTICULATA (var. HUMIFUSA) × SMITHIANA, n. hybr.—Prostrata, sed apice ramorum sæpius aliquantum ascendens. Flores soltarii ternatique intermixti. Spicæ crassiusculæ, longitudine (1–2·5 cm.) sat variabiles. Planta ramosissima, pro more subtriangulari-flabellata, quam in *S. Smithiana* laxior. Color in autumno lateritius vel sanguineus. Segmenta quam in *S. disarticulata* minus quidem, admodum tamen disarticulantia.

Prostrate, but generally somewhat ascending at the tips of the branches. Solitary and threefold flowers intermixed. Spikes rather stout, varying considerably in length (1–2·5 cm.). Plant very much branched, as a rule subtriangular-fanshaped, laxer than in *S. Smithiana*. Colour in autumn brick-red or blood-red. Segments shedding considerably, though less freely than in *S. disarticulata*.

Exsiccata.—Herb. Marshall, No. 4214.

Scarce and very local on sandy mud-flats, with the parents; Dawlish Warren, v.-c. 3 S. Devon, Sept. 21, 28, 1915.

A good intermediate. Single flowers predominate; when there are three, the lateral are much smaller than the central, and probably abortive; but this has not been tested by microscopical examination. It varies from four to eight inches in length, and from three to six in greatest breadth. *S. Smithiana* is rather uncommon, here, and was not seen in any great quantity.

RUMEX MARITIMUS L.

By E. Adrian Woodruffe-Peacock, F.L.S.

In working out my forty years' ecological notes for the Flora of Lincolnshire many curious facts are coming to light. Those I have collected in reference to the "Golden Dock" may be taken as an example. The plant is recorded for the Watsonian vice-counties 27, 28, 29, 32, 55, 56, 61, 63; the so-called *R. limosus* for 27, 28, 29, 56, 61: in the Lincolnshire natural history divisions *R. maritimus* for 2, 3, 5, 6, 7, 10, 11, 12, 13, 14, 16, 17, 18, and *R. limosus* for 2, 3, 12, 13, 14, 16, 17, 18.

R. conglomeratus is practically all over the vice-counties and our local Lincolnshire divisions, except on peaty soils. I have also full proof that *maritimus* is carried by wind, water, and birds, *i. e.* wild ducks.

R. maritimus—inland at least—is an unstable species. It spreads on damp, sandy, gravelly, and peaty soils in a series of wet seasons, like those before 1893, and retires in dry ones like those of 1893–1900. More can be seen in this fact than at first sight appears. *R. maritimus* is the plant always first found in a fresh locality, as Fowler's and Lee's notes prove. Then two

or three seasons after it has been noted as a new arrival, *R. limosus* is found along with it. If the seasons grow suddenly dry it takes the place of *maritimus*, itself departing two or three seasons later if the drought continues. The succession round ponds on sandy glacial gravel, and by a moat on Kimmeridge clay, was in 1891–93 *R. maritimus* only, in 1893 both, in 1894–96 *R. limosus* only; since that date neither has appeared.

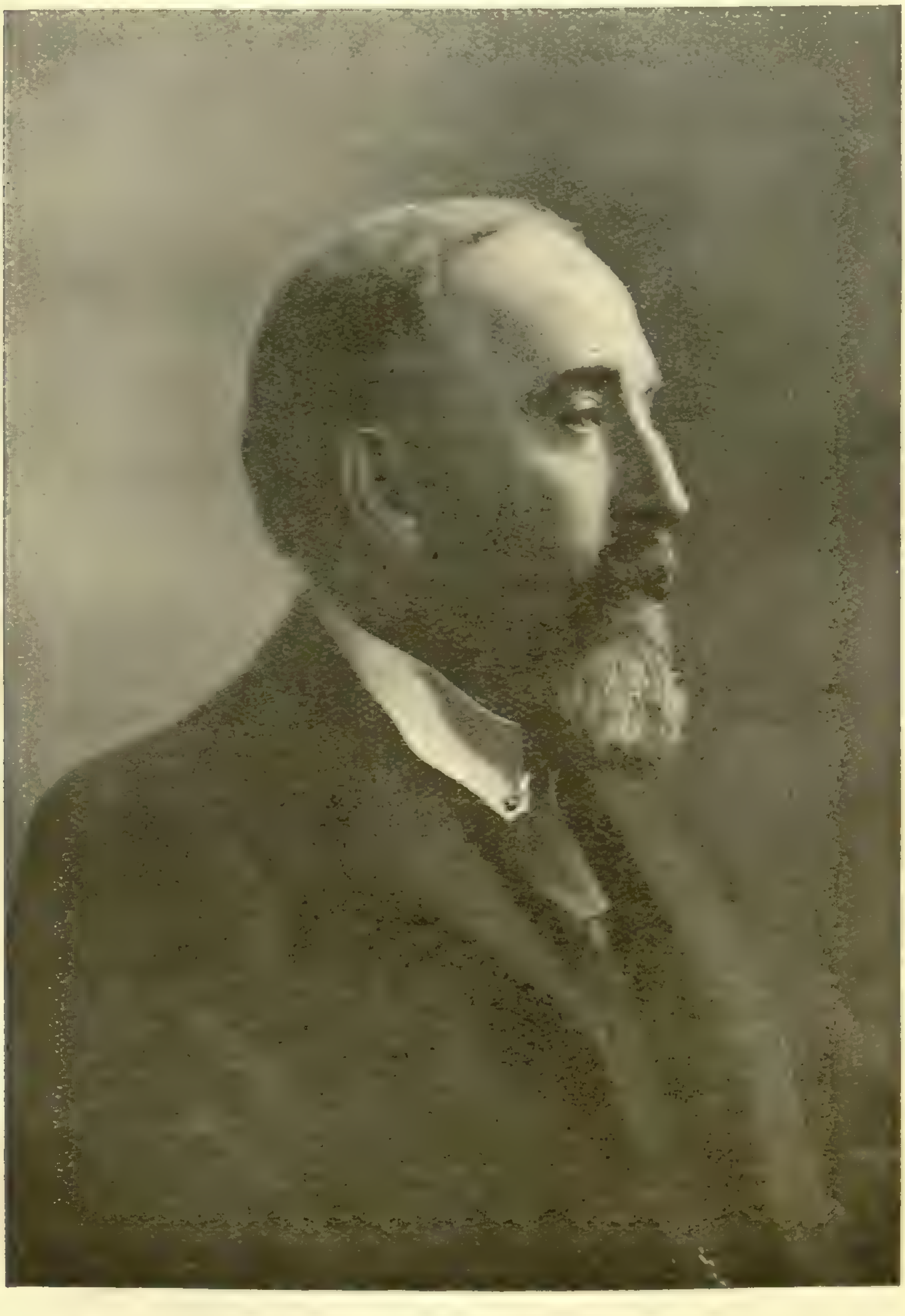
R. maritimus is physically a constant species with characters that vary little; on the other hand *R. limosus* is flexible and confluent in character. I find *R. maritimus* is from one to two feet high; *R. limosus* two to three. This is also the height of *R. conglomeratus*. *R. limosus* can resist drought better of the two though not to any great extent, as might be expected, if it is a true hydrid between them. These latter points do not entirely rest on my own observation. Mr. Bernard Reynolds wrote to me in 1912: "Near Boston, on estuarine alluvium, we saw many forms of *R. maritimus* showing all grades of sizes to huge *R. limosus*. I am convinced that you are correct in saying the *limosus* forms are *maritimus* × *conglomeratus* hybrids." If they are not hybrids I do not know what the signs of hybridity are, either by the instability of its physical characters or by the circumstances of its ecology. One single point in ecology will demonstrate what I mean. The succession alluded to above is not confined to one soil. It has been noted on five, but never on any form of peat—*Sphagnum*, *Hypnum*, *Sparganium*—*Carex*, or *Pteris* peat. Why? May we not safely assume it is because *R. conglomeratus* has never been recorded yet for any peaty soil in this county?

RICHARD MANLIFFE BARRINGTON
(1849–1915.)

By the death on September 15th of Richard Manliffe Barrington, Ireland has lost the last of that group of enterprising and energetic field botanists which may almost be said to have been created by the genius of A. G. More. During the 'seventies and 'eighties, while More was actively engaged on the preparation of the second edition of *Cybele Hibernica*, he gathered round him a singularly efficient band of helpers, of whom Barrington, Hart, Vowell, and Barrett-Hamilton were the chief. Under More's direction an extensive campaign of field work was carried out, special attention being paid to the Irish mountain-ranges and to the shores of the larger lakes and rivers. The result largely increased our knowledge of the Irish flora, and a full share of this work was carried out by Barrington.

Born in 1849, his love of natural science displayed itself while he was still a child. He passed through Trinity College, Dublin, taking an honour degree in science, and then studying law was called to the Bar in 1875. But the law had few attractions for him, and he devoted a vigorous life to the business of land valuation, and to the management of the large farm attached

to the beautiful family residence of Fassaroe, near Bray, in Co. Wicklow. The visits to many remote parts of Ireland which the former occupation entailed were entirely to his taste. His keen eye was always on the watch for rare plants, and he often



managed to combine with his professional trips incursions into unexplored regions of mountain, seashore, or lake. Endowed with an athletic body and singular pluck and skill as a climber, the mountains had ever a special attraction for him. Some of his feats in this domain were indeed remarkable, as for instance, his record of 84,500 ft. of climbing within eleven days in Switzerland. As early as his undergraduate days he had made the acquaintance of A. G. More, whose footsteps he followed throughout life as a

student of flowering plants, mammals, and birds. His earliest contribution to botany, published in this Journal in 1872, clearly reflects More's influence. It is a record of attempts to rediscover three missing Irish plants—*Lythrum Hyssopifolia*, *Erica vagans*, and *Euphorbia Peplis*—enterprises in which subsequent explorers have been no more successful than himself.

In 1877 Barrington began the series of botanical explorations which occupied much of his attention during the next ten or twelve years. The wild island of Tory, lying off the coast of Donegal, was the first area selected for investigation, and a week was spent in listing its wind-swept flora, which proved poor and comparatively uninteresting. Two years later he attempted an exploration of the Blaskets, a mountainous island-group of the extreme south-west of Ireland; bad weather, want of time, and the hostility of the islanders owing to agrarian troubles, frustrated for the time his efforts, but returning in the following season he was successful. This was an enterprise well suited to Barrington's taste. The savage precipices and the wild sea were worthy antagonists of his skill and daring, and within five days he had succeeded in landing on and exploring practically every island of the group. The results of his work appeared, as did most of his subsequent botanical reports, in the *Proceedings of the Royal Irish Academy*.

During the summers of 1881 and 1882 the shores and islands of Lough Erne, in Co. Fermanagh, were explored. *Caltha radicans* and *Potamogeton Zizii* were found for the first time in Ireland, and many additions made to the flora of the district. Two weeks in 1884 were devoted to a survey of the interesting flora which clings to the tall limestone cliff-walls of the Ben Bulben plateau in Sligo and Leitrim. This is one of the most famous of the botanical hunting-grounds of Ireland, long known as the home of *Arenaria ciliata* and *Polygala grandiflora*, and of an abundant alpine flora. Barrington's skill as a climber stood him in good stead here. The range of the rarer plants was for the first time defined and in many cases extended, and *Epilobium alsinifolium* was added to the Irish flora. A few years later, assisted as on his last exploration by his friend R. P. Vowell, he surveyed the great expansion of the Shannon known as Lough Ree.

During all these years ornithology had also occupied much of Barrington's leisure time, and from 1882 onwards migration observations conducted mainly through the keepers of Irish light-houses took a foremost place with him, resulting at length in the publication of his well-known book on the subject. But to the last his interest in botany continued unimpaired, and numerous useful observations were made on his many journeys through Ireland. His fresh enthusiasm remained with him until his sudden death, which was due to heart failure.

Barrington was a singularly lovable man. His hearty friendliness, his sense of humour, and a charming modesty which characterized all his intercourse, combined with a boyish enthusiasm which time did not impair, made his presence

welcome and stimulating everywhere, and brought him a host of friends. His death leaves a gap in the ranks of British field naturalists which cannot be filled.

R. Lloyd Praeger.

For the use of the accompanying portrait we are indebted to the editors of the *Irish Naturalist*.

REPORT OF DEPARTMENT OF BOTANY, BRITISH MUSEUM, 1914.

By A. B. Rendle, D.Sc., F.R.S.

Acquisitions.

(1) *By Donation.*

Additions to the British Herbarium have been received from the following donors:—The Council of the South London Botanical Institute, seeds of 9 species, mainly British; A. Bennett, 4 phanerogams; J. E. Cooper, 9 species of alien plants; J. Gaskill, a small collection of lichens, mostly British; Rev. H. G. Jameson, 285 microscope-preparations of hepaticæ; Miss G. Lister, 12 mycetozoa; J. E. Little, 44 phanerogams; Mrs. A. McCutcheon, 17 vascular cryptogams, collected by the Misses D'Arcy; Rev. E. S. Marshall, 179 phanerogams; Major-General J. B. Richardson, 2 phanerogams and 8 cryptogams, collected by Sir John Richardson; C. E. Salmon, 25 phanerogams; W. R. Sherrin, 2 mosses from Cricksea, Essex; H. Stewart Thompson, 86 mosses (mostly British) and a hepatic.

The following donations have been made to the General Herbarium:—

Europe.—Prof. I. Douin, 2 mosses and hepatics from France; Mrs. A. McCutcheon, 3 vascular cryptogams; H. Stuart Thompson, 46 phanerogams from Department Var, France.

Asia.—The Regius Keeper, Royal Botanic Garden, Edinburgh, 531 phanerogams collected in Western China by E. E. Maire, and 1408 phanerogams and 33 cryptogams collected in Yunnan, Western China, by G. Forrest; H. N. Dixon, 16 hepaticæ, mostly from India; H. C. Robinson, 91 phanerogams and 3 ferns from Selangor, 17 orchids from Gunong Mengkuang, and 62 phanerogams and 7 ferns from Gunong Kerbau.

Africa.—The Trustees of the Percy Sladen Memorial Fund, 698 plants collected in South-west Africa by Prof. H. H. W. Pearson, Miss R. Glover, and others; Lieut. G. St. J. Orde Browne, 91 phanerogams and 5 vascular cryptogams from Mt. Kenya, British East Africa; R. H. Bunting, 100 phanerogams, 1 fern, and 6 tubes of freshwater algæ from Sierra Leone; Mrs. M. E. Prescott-Decie, 184 phanerogams and 7 cryptogams from British East Africa; Capt. H. G. Lynes, 145 phanerogams, 3 vascular cryptogams, and 11 tubes of diatoms, collected in the Nile and Red Sea Province; Mrs. A. McCutcheon, 39 vascular cryptogams

collected in Madeira by the Misses D'Arcy; Dr. R. Marloth, 4 South African plants; R. E. Massey, 24 plants from the Sudan; the Hon. Walter Rothschild, F.R.S., 110 plants from South-west, and 12 from Central, Algeria; T. A. Sprague and J. Hutchinson, 3 plants from Madeira; Mr. and Mrs. P. Amaury Talbot, 141 phanerogams from Degema, Southern Nigeria; Capt. N. R. Wilkinson, 42 species of vascular cryptogams, collected in Madeira by the late N. H. Mason; Miss E. S. Youngs, specimens and drawing of *Stapelia flavirostris* from Orange River Colony.

Australasia.—W. M. Cole, a small collection of New Zealand cryptogams; Miss Mary Delprat, 38 Australian plants; Miss J. Heywood, 18 lichens and 1 moss from New Zealand; Dr. A. B. Rendle, 90 phanerogams from South Australia, 24 phanerogams from Victoria, 14 phanerogams from New South Wales, and 51 cryptogams and 3 tubes of freshwater algæ from South Australia, Victoria, and New Zealand; O. Sargent, 8 species of *Stylidium* from West Australia; Dr. F. Stoward, 26 phanerogams from West Australia.

Oceania.—The Committee and Subscribers of the Wollaston Expedition to Dutch New Guinea, 1714 phanerogams, 189 vascular cryptogams and 1 hepatic, collected by C. B. Kloss.

America.—The Colonial Secretary, through the Director of Agriculture, Jamaica, 9 phanerogams from Jamaica; the Councils of the British Association and the Zoological Society of London, 17 phanerogams and 72 cryptogams, mostly collected in South Georgia by P. Stammwitz during the Barrett-Hamilton Expedition; the Hon. Cecil Baring, 29 phanerogams and 6 ferns from Brazil; A. Bennett, 23 waterweeds, mostly American; Miss A. Calvert, 408 phanerogams and 87 cryptogams from Central Chile; H. O. Forbes, 100 phanerogams and 14 cryptogams from Peru; L. R. Wheeler, 37 phanerogams and 1 fern from Antigua, West Indies.

General.—Miss G. Lister, 49 herbarium specimens and 37 microscope-preparations of exotic mycetozoa; Mrs. R. H. Middleton, 92 hand-sections of woods from Ceylon and elsewhere.

Cultivated Plants.—Dr. E. S. Blaker, 6 phanerogams; R. Grove, specimens of abnormal pears; W. E. Ledger, 15 phanerogams; Messrs. H. B. May & Son, 96 exhibition specimens of *Nephrolepis* and other fern fronds; Hon. N. C. Rothschild, 16 species of orchids.

(1) *By Purchase.*

British Isles.—The Botanical Exchange Club, 309 phanerogams; Rev. W. Johnson, 40 specimens, being the North of England Lichen-Herbarium, fasc. xii.; Rev. E. F. Linton, 12 specimens of willows; W. H. Pearson, 941 hepaticæ; Lloyd Praeger, 684 Irish plants.

Europe.—O. Jaap, 25 fungi selecti exsiccati, ser. xxvii., and 20 Myxomycetes exsiccati, ser. viii.; J. E. Kabát and F. Bubák, 50 Fungi Imperfecti exsiccati, fasc. xvi.; K. W. Krieger, 50 Fungi Saxonici exsiccati, fasc. xlvi.; J. Mikutowicz, 611 mosses, Bryotheca Baltica, lief. xi.–xiv., and Nachtrag, lief. i.–x.; V.

Schiffner, 200 Hepaticæ Europææ exsiccatæ, ser. x.–xiii.; G. Seefeldner, 30 Algæ Adriaticæ, fasc. iii.; T. Vestergren, 100 micromycetes rariores selecti, fasc. lxix.–lxxii.; A. Fiori and A. Béguinot, Flora Italica exsiccata, cent. xix., xx., and 10 micro-sections of woods; A. von Hayek, 50 Centaureæ exsiccatæ criticæ, fasc. ii. E. Collinder, 30 Rosæ Sueciæ exsiccatæ, fasc. i.; H. Dahlstedt, 54 Taraxaca Scandinavica, fasc. iii.; F. Petrak, 140 specimens, Cirsiotheca Universa (mostly European), fasc. i.–xiv., also 1250 cryptogams, Flora Bohemiæ et Moraviæ exsiccata, ser. ii., being Abt. i., Pilze, lief. i.–xxi. (1050 fungi), and Abt. iii., Moose, lief. i.–iv. (200 mosses); H. Sudre, Batotheca Europæa, fasc. xii., 50 specimens, and Herbarium Hieraciorum, fasc. iv., 50 specimens.

Asia.—Arnold Arboretum, U.S.A., 1248 phanerogams and 11 ferns collected in China by E. H. Wilson; Rev. J. Gurney Barclay, 174 Japanese ferns; A. D. E. Elmer, 660 phanerogams and 189 cryptogams from the Philippine Islands; W. Siehe, Flora Orientalis, 148 selected specimens from Asia Minor.

Africa.—D. A. Bannerman, 19 phanerogams and 1 lichen from Eastern Canary Islands; E. Chiovenda, Flora della Colonia Eritrea, cent. iii., iv., prepared by A. Pappi; A. R. Dümmer, 717 phanerogams and 83 cryptogams from Uganda; E. Gilg, 383 phanerogams collected in the Cameroons by G. Zenker; C. Steyer, 768 phanerogams and 32 cryptogams collected in South Angola by J. Gossweiler; F. Wilms, 238 phanerogams and 6 cryptogams collected in Natal by H. Rudatis, and 197 phanerogams and 1 cryptogam from Nyassa, collected by A. Stolz.

Oceania.—J. E. Tilden, South Pacific Plants, 392 phanerogams and 103 cryptogams.

America.—E. Bartholomew, 300 Fungi Columbiani, cent. xliii.–xlv., and 300 North American Uredinales, cent. ix.–xi.; T. S. Brandegee, 312 phanerogams and 68 vascular cryptogams collected in Mexico by C. A. Purpus; A. Brinkman, 177 mosses and 19 hepatics from British Columbia; W. E. Broadway, 90 phanerogams and 10 vascular cryptogams from Tobago, West Indies (through Mrs. E. J. Broadway); Collins, Holden & Setchell, 50 algæ, Phycotheca Boreali-Americana, fasc. xxxix. (through Dulau & Co.); K. Fiebrig, 306 phanerogams and 31 cryptogams from Paraquay (through P. Weber); T. Herzog, 198 mosses from Bolivia (through T. O. Weigel); J. Macoun, 223 Canadian cryptogams; C. Skottsberg, 220 mosses and 184 hepatics from temperate South America; A. Tonduz, 74 phanerogams and 26 vascular cryptogams from Costa Rica.

General.—H. Rehm, 66 fungi, Ascomycetes exsiccati, fasc. liv., lv.; H. Sydow, 100 Fungi exotici exsiccati, fasc. v. vi.; W. H. Pearson, 270 hepaticæ (European, American, and Asiatic); A. Zahlbruchner, 22 lichens rariores exsiccati (Nos. 166–187).

(3) *By Exchange of Duplicates.*

Oakes Ames, 127 orchids from the Philippine Islands; Director, Arnold Arboretum, Jamaica Plain, Massachusetts, 86

Mexican pines, collected by G. R. Shaw; Director, Royal Botanic Gardens, Calcutta, 65 Asiatic plants; Curator, National Museum, Melbourne, Victoria, 75 Australian plants; Director, Botanical Garden, New York, 144 phanerogams, mostly from Jamaica; Director Herbarium, Muséum d'Histoire Naturelle, Paris, 1069 phanerogams and 104 vascular cryptogams, from Tropical Africa, China, New Caledonia, and Brazil; Curator, Department of Botany, Riksmuseets, Stockholm, 96 Temperate South American grasses; Director, National Herbarium, Sydney, New South Wales, 95 Australian plants; Curator, U.S. National Museum, Washington, 200 American grasses, collected by A. S. Hitchcock.

BIBLIOGRAPHICAL NOTES.

LXII.—Willkomm's Botanical Works.

How much botanists are indebted to Heinrich Moriz Willkomm [1821–95] may be readily appreciated by reference to the comprehensive list of his publications, appended to Dr. Richard R. von Wettstein's obituary notice of him in the *Berichte der Deutschen Botanischen Gesellschaft*, xiv. pp. (13)–(25), 1896. But useful as this list is, it would have been still more so had the opportunity been taken to give exact information of the contents and dates of issue of the parts of such works as were published serially.

The following notes were brought together for inclusion in the fifth volume of the *Catalogue of the Books in the British Museum* (*Natural History*) issued recently, but it was found impossible then to supply some of the data which have since come to hand; hence, little beyond particulars of the *Icones* is there given.

In the following lists the title, place and date of publication taken from the title-page are first given, followed by particulars of the parts as issued; an authority for each statement is cited.

Icones et descriptiones Plantarum novarum criticarum et rariorum Europæ austro-occidentalis præcipue Hispaniæ. Tom. i. Lipsiæ, 1852. Tom. ii. Lipsiæ, 1856.

Issued in nineteen parts as follows:—

Tom. i. (*Sileneæ* and *Alsineæ*).

Fasc.	Pp.	Pl.			
1	1–16	1–7 (1852)	Zuchold, Bibl. Hist. Nat.	ii.	118.
2	17–24	8–13 (1853)			
3	25–32	14–20 (1853)	,, ,,	iii.	33.
4	33–40	21–28 (1853)	,, ,,	iii.	117.
5	41–48	29–35 (1854)	,, ,,	iv.	47.
6	49–56	36–41 (1854)			
7	57–64	42–46 (1854)	,, ,,	iv.	139.
8	65–80	47–53 (1854)			
9	81–104	54–63 (1855)	,, ,,	v.	140.
10	105–123	64–73 (1856)	,, ,,	vi.	153.

Tom. ii. (*Cistinearum orbis veteris descriptio*, &c.).

Fasc.	Pp.	Pl.		
11	1–24	74–83	(1857)	Zuchold, Bibl. Hist. Nat. vii. 175.
12	25–40	84–93	(1858)	,, ,, viii. 37.
13	41–56	94–101	(1858)	Kayser, Index, xiv. 546.
14	57–68	102–109	(1859)	,, xvi. 547.
15	69–84	110–118	(1859)	Flora, xlii. 186.
16	85–96	119–128	(1859)	Zuchold, *op. cit.* ix. 173.
17	97–108	129–138	(1861)	,, xi. 35.
18	109–120	139–148	(1861)	
19	121–182	149–158	(1862)	,, xi. 132.

Prodromus Floræ Hispanicæ. Band i. Stuttgart, 1861. Band ii. Stuttgart, 1870. Band iii. Stuttgart, 1880.

This important work, in the production of which Johan Lange collaborated, furnished the compilers of the *International Rules of Botanical Nomenclature* with an example for Art. 39. It is there shown that Band iii. was issued in parts, the dates of publication of which supersede that given on the title-page in determining questions of priority. Why Band iii. was chosen for this purpose in preference to the earlier volumes is not obvious.

Bd.	Pars.	Pp.		
i.	1	i–viii, 1–192	(1861)	Bot. Zeit. xx. 13.
	2	ix–xxx, 193–316	(1862)	,, ,, xx. 119.
ii.	1	1–272	(1865)	,, ,, xxiv. 142.
	2	273–480	(1868)	,, ,, xxvi. 655.
	3	481–680	(1870)	,, ,, xxviii. 485.
iii.	1	1–240	(1874)	,, ,, xxxii. 432 & 589.
	2	241–512	(1877)	,, ,, xxxv. 199.
	3	513–736	(1878)	,, ,, xxxvi. 728.
	4	737–1144	(1880)	,, ,, xxxviii. 496.

Supplementum.
Pp. ix, 370. Stuttgart, 1893.

Führer ins Reich der deutschen Pflanzen. Leipzig, 1863.

Issued in two parts; pp. 1–286, tt. 1–7 in 1862 and pp. i–x, 283 (*bis*)–678 in 1863. It was re-issued with a new title-page in 1879.

Ed. 2. Leipzig, 1882.

This was issued in twelve parts with the title *Führer in das Reich der Pflanzen Deutschlands, Österreichs und der Schweiz*; eleven parts, each of which contained eighty pages of text, appeared in 1881, the concluding part (pp. i–xv, 881–928) in the latter half of 1882. (See Zuchold, *Bibl. Hist. Nat.* xxxi. and xxxii. (*passim*) and Friedlander, *Naturæ Novitates*, 1881–82.)

Forstliche Flora von Deutschland und Oesterreich. Pp. viii, 871.
Leipzig and Heidelberg, 1875.

Issued in parts of about eighty pages of text from 1872–75.

Ed. 2. Leipzig, 1887.

Issued in twelve parts; pts. 1–11 each contained eighty pages

and appeared in 1886, the concluding part (pp. i–xii, 881–968) in 1887. (See Zuchold, and Friedlander.)

Bilder-Atlas des Pflanzenreichs nach dem natürlichen System.

Four editions were published at Esslingen, bearing the dates 1885, 1893, 1896 and 1901 respectively. The first was issued in nine parts (pp. viii, 88, tt. 68) in 1884–85 (see Just, *Bot. Jahresb.* 1884, i. 537 and *Bot. Centralb.* xxi. 97; xxiii. 65; xxv. 134); the second in twenty-one parts (pp. viii, 88, tt. 58) in 1892–93 (Just, *op. cit.* 1892, i. 270 and *Bot. Zeit.* li. II. 112). The publication of the later editions was completed after Willkomm's death, they were considerably enlarged and contained one hundred and twenty-four coloured plates; ed. 3 was issued in fifteen parts, fourteen of which (pp. i–viii, 1–134, tt. 1–116) appeared in 1895, the concluding part in 1896 (see *Bot. Zeit.* liii. II. 391; liv. II. 288). The fourth edition was published in 1901.

Illustrationes Floræ Hispaniæ insularumque Balearium. Tom. i. Stuttgart, 1881-85. Tom. ii. Stuttgart, 1886–92.

Issued with coloured or uncoloured plates as follows:—

Tom.	lief.	Pp.	tt.		
i.	1	1–12	1–9	(1881)	Bot. Centralb. vi. 318.
	2	13–28	10–18	(1881)	
	3	29–40	19–28	(1881)	,, ,, ix. 270.
	4	41–56	29–38	(1882)	,, ,, x. 398.
	5	57–72	39–47	(1882)	,, ,, xii. 372.
	6	73–88	48–56	(1882)	,, ,, xv. 80.
	7	89–104	57–65	(1883)	,. ,, xvi. 364.
	8	105–120	66–74	(1883)	,, ,, xvii. 300.
	9	121–136	75–83	(1884)	,, ,, xxi. 233.
	10	i–vii, 137–157	84–92	(1885)	,, ,, xxiv. 362.
ii.	11	1–16	93–101	(1886)	,, ,, xxv. 102.
	12	17–32	102–110	(1886)	,, ,, xxix. 301.
	13	33–48	111–119	(1887)	,, ,, xxxiii. 178.
	14	49–64	120–127	(1888)	,, ,, xxxvi. 176.
	15	65–84	128–137	(1889)	,, ,, xlii. 347.
	16	85–98	138–146	(1889)	,, ,,
	17	99–112	147–155	(1890)	,, ,, xlv. 150.
	18	113–126	156–164	(1891)	,, ,, xlviii. 226.
	19	127–140	165–173	(1892)	,, ,, liii. 86.
	20	i–vii, 141–156	174–183	(1892)	,, ,, liv. 244.

F. G. WILTSHEAR.

SHORT NOTES.

SCORZONERA HUMILIS L. (p. 311).—I also found this plant quite independently on June 5th of this year in the locality mentioned by Mrs. Sandwith. The conditions under which the plant is growing seem to me, also, to be perfectly natural, for it is associated not only with ligulate *Compositæ*, but with the usual plants of moory meadows, such as buttercups, plantains, *Scabiosa Succisa*, *Lysimachia vulgaris*, *Hydrocotyle*, rushes,

sedges, coarse grasses, &c. The meadow in question has been under grass for about thirty years, previous to which it was arable. I understand that the plant is common on the Continent, especially in Belgium and France, where it grows in similar situations: it is unknown in cultivation, and has not been previously recorded as an alien. It may be as well to add that the locality given is in proximity to Poole Harbour, where birds, migratory and otherwise, abound, and where there still is a good deal of trading going on: moreover, this particular meadow is subject periodically to inundation.—C. B. Green.

Potamogeton interruptus Kit. in Greece. — This plant which is not included in Halácsy's excellent Consp. Fl. Græca, I found in a small stream running into the Gulf of Marathon, in May, 1914. I have submitted it to Mr. A. Bennett. My special purpose in visiting Greece was to purchase the extensive herbarium which had been formed by the late M. Halácsy, but I found it had recently been acquired by the Austrian Government and is to be housed at Vienna. Among the five hundred species noted by me in Greece was the very local *Arenaria procumbens* Vahl, which belongs to the section *Rhodalsine* J. Gay, having pink flowers. Heldreich discovered it on the island Ægina, and formerly it grew in one place on the coast near Phalerum, but has been destroyed. I was therefore glad to add it once again to the mainland, growing on dry hilly ground between Itea and Delphi. At Itea *Spergularia atheniensis* grew; it is common about Athens, and is clearly identical with our Jersey plant. On Lycabettus the pink-flowered form of the Bladder Campion occurs, and I also saw it at Delphi.—G. Claridge Druce.

Hyssopus officinalis L.—Not very long ago I embraced an opportunity of visiting the ruins of Beaulieu Abbey, Hants, and had the satisfaction of seeing this S. European plant in its old established long-recorded habitat. It may interest botanists to know it still grows plentifully on the tops of, and crevices in, the walls of the ancient chapel and other buildings, but nearly altogether out of reach, perhaps happily so. The owner, Lord Montague of Beaulieu, very wisely does not allow any specimens either of this or of the *Dianthus plumarius* growing with it to be gathered, and accordingly the chances are in favour of its remaining intact and increasing, let us hope, for all time.—J. Cosmo Melvill.

REVIEWS.

Flora of New Mexico. By E. O. Wooton and Paul C. Standley. 8vo, pp. 794. (Contrib. from U. S. National Herbarium, vol. 19.) Washington, June 24, 1915.

This important contribution to our knowledge of the Flora of New Mexico has been undertaken at the instance of Dr. F. V. Coville, the curator of the U. S. National Herbarium, who prefixes a short preface from which we learn that the authors both by knowledge of plants in the field and by herbarium work, are

thoroughly qualified for their task. Mr. Wooton was for twenty years, and Mr. Standley for three, connected with the New Mexico College of Agriculture, and both have made extensive botanical collections, upon which the volume is largely based, although all other available New Mexican collections have been studied.

The number of species treated in the volume, which is confined to the flowering plants and vascular cryptogams, is 2975, but as many large portions of the State have never been visited by any botanist, this number will be greatly increased. There are keys to the families, genera, and species, the genera alone being fully described. The place of publication of each species is cited, and the synonymy, so far as it relates to New Mexican botany, is given: for bibliography reference is made to a previous volume of the *Contributions*, where this is given in detail by Mr. Standley. The "type locality," so far as possible, is given for each species, with its geographical range and its distribution in the State, and useful notes on individual species are sometimes added.

The nomenclature follows the lines referred to in our last issue (p. 335, top); in this as in other respects—*e.g.* in the non-use of capitals for specific names which commemorate a person—the book is in direct opposition to the Vienna Rules, and certainly makes an author say what it would never have occurred to him to say—e.g. "*Notholæna sinuata integerrima* Hook.," "*Phaseolus acutifolius tenuifolius* A. Gray." Turning over the pages one sees ample ground for criticism in this direction, did space permit; thus "*Ratibida columnifera* (Nutt.) Woot. & Standl." is a new combination, based upon "*Rudbeckia columnifera* (Nutt.) Fraser's Cat. no. 75, 1813," which supersedes "*Rudbeckia columnaris* Pursh Fl. Amer. Sept. 575, 1814." On this it may be noted that Nuttall's name was never published in connection with Fraser's Catalogue, although Dr. E. L. Greene has produced evidence (Pittonia ii. 114) to show that he was its author: moreover, as was shown in this Journal (1899, 482), the Catalogue must be cited as "Frasers'": the heading describes the plants—as "for sale at Messrs. Fraser's Nursery . . . 1813"—a date at which the original John Fraser was dead, the business being carried on by his two sons, John and James Thomas. It may moreover be doubted whether the Catalogue comes within the definition of Art. 35: "Publication is effected by the sale or *public distribution* of printed matter." The species is followed by "*Ratibida columnifera pulcherrima* (DC.) Woot. & Standl." based on *Obeliscaria pulcherrima* DC. which Don placed as a variety of *R. columnaris*: this the authors say "is a mere form of the type, and hardly deserves a name." Yet they give it a new one, though they proceed: "Both forms almost invariably occur together, although occasionally they grow alone: it is possible to find in a single patch every possible gradation in the color of the rays from pure bright yellow to solid brown-purple. The same variation in color occurs in *R. tagetes*, but since that has very small and inconspicuous rays no one has yet thought to distinguish the various forms by name" (p. 706). We note also

that the general and useful practice of prefixing "in" to the title of a periodical quoted—"A. Gray *in* Proc. Amer. Acad."—is departed from throughout.

Apart from minor though not unimportant matters of this kind, it is evident even to those unacquainted with the plants of the region to which it relates that the work has been executed with great care and thoroughness, and that to all students of the Flora, whether in the herbarium or in the field, it will be an invaluable guide.

The Human Side of Plants. By Royal Dixon. With four illustrations in colour and thirty-two in black and white. Sm. 4to, pp. xviii, 201. Price 7*s.* 6*d.* net. Grant Richards.

"The Human Side of Plants is the unlocking of the doors which have barred us from the mysteries of the plant kingdom. It is an entrance into the private life of plantkind. What secrets we may learn from the plant nature and habits and characteristics to help us in understanding the origin, purpose, and extent of life, can be found only by an intimate acquaintance with the inner life of the plants." Such is the author's definition of his subject: he further informs us that in this book he is "blazing a trail" and "declaring heretofore unpublished truths which must unquestionably meet the censure of the book-taught botanists of the old schools, but which will quite as unquestionably meet the entire approval of those naturalist-botanists of the more modern type, who accept no result without its cause and who study life for the love of it, with no prescribed limitations of fact or possibility."

The old notion that there was a line of demarcation firmly fixed between plants and animals has of course long since been abandoned; but it is startling to find that the former have developed all the characteristics of animals and indeed of men. We have of course long been familiar with plants that eat insects, defend themselves, predict the weather, tell the time, and go to sleep: but Mr. Dixon shows us that they "see, hear, taste, feel, walk, swim, run, fly, jump, skip, hop, roll, tumble, set traps and catch fish; play hide and seek—indeed, do all the things which we ourselves do! We know now that plants have even minds and souls, with which to think and to worship." This thesis he develops in a series of chapters with startling headings: *e. g.* "Plants that carry Life Insurance"—*i. e.* "by storing away food-material in the basement or underground bank; that is, in bulbs and roots": "Plants that rob, plunder, and murder," *i. e.* parasites; "Plants that ride on animals"; "Plants that entertain"—"civilized flowers make good hostesses: not only do they decorate their houses in gorgeous colours, perfume the palatial inner walls, and powder their pretty faces with golden pollen, but they actually prepare inviting feasts for their insect guests." In the concluding chapter the author claims to show that "it is positively known that plants do have both an active existing mentality and a very evident spiritual nature."

It must be admitted that Mr. Dixon is well acquainted with the North American flora, from which he takes his examples, and

that these go far to support his thesis, once it is admitted that plants do not act as they do "because they must," but are endowed with volition—a view which finds some support in the researches of Mr. Francis Darwin and others. He has certainly given us an interesting and readable book, the attractiveness of which is greatly increased by the numerous and beautiful full-page illustrations.

BOOK-NOTES, NEWS, &c.

We are indebted to Mr. Morton P. Porsild for a reprint from the *Meddelelser om Gronland* of his paper "On the Genus *Antennaria*" in that country. The result of his study, since 1906, of the forms of that genus has induced him to raise to specific rank *A. alpina γ glabrata* of J. Vahl and *A. alpina* var. *intermedia* of Rosenvinge and to name as *A. groenlandica*, without indicating its supposed rank, *A. dioeca* var. *hyperborea* of Lange. The paper, which is illustrated by excellent figures and is written in English, will interest British botanists.

The first instalment of the systematic portion of Father Blatter's *Flora of Aden*, the introductory part of which we noticed last year (p. 255) forms no. 2 of the seventh volume of the *Records of the Botanical Survey of India* (issued in April). The arrangement of Bentham & Hooker is followed and the enumeration is carried down to the end of *Urticaceæ*. The species are treated at great length, the descriptions being very full and the synonymy copious: the latter would have been more valuable had the dates of publication been added to the citations—these are however entirely omitted. A good deal of information is brought together regarding such plants of economic value as *Boswellia* and *Commiphora*; the geographical distribution is given in detail, and the literature connected with the Flora appears to have been exhaustively studied. The typographical arrangements might have been improved, and it seems absurd to waste the space at the head of each page by a repetition of "Flora of Aden." It is probable that investigation would suggest occasional criticisms as to nomenclature—*e. g.* it cannot be correct to place as the first reference for *Kissenia spathulata*, "R. Br. in Herb. Mus. Brit.," which cannot be regarded as a publication. No new species is described.

We regret to announce the death of Mr. Thomas Prichard Newman, which took place, from heart failure, on the platform of Haslemere Station on the 10th of November. Mr. Newman, who was in his seventieth year, became publisher and printer of this Journal in 1878, two years before the present Editor became responsible for its contents.

The first revision of the *Biographical Index of British and Irish Botanists* being now practically completed, it is hoped that it may be possible to publish the second edition in 1916. It is hoped that any corrections or additions to the work will be forwarded as soon as possible to the Editor of this Journal, 41 Boston Road, Brentford, Middlesex, in order that they may be incorporated during the final revision for press. It is proposed to bring the work up to the end of 1915.

THE LICHENS OF PERTHSHIRE

BEING A PRELIMINARY LIST OF SPECIES FOUND WITHIN THE THREE VICE-COUNTIES

BY

J. A. WHELDON, F.L.S., & ALBERT WILSON, F.L.S.

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Introduction.

In publishing the following account of the lichens of Perthshire we are well aware that it can hardly claim to be more than a foundation or framework for future work. Perthshire is a large county, very diversified and mountainous in character, with large tracts quite uninhabited and far removed from road or railway. Floristically, it is perhaps the richest and most interesting inland county in Scotland—if not in Britain—as also one of the most beautiful and varied from a scenic point of view. The phanerogams and vascular cryptogams are fairly well known, having been investigated by many workers, including nearly all our leading field botanists; and the same may be said, though perhaps in a less degree, of the mosses and hepatics. With regard to the lichens, however, although these plants abound almost everywhere, and in some parts grow with great luxuriance, the workers in recent times have been comparatively few. Old records are fairly numerous, but the localities are not very well distributed over the county, the greater part, as would be expected, being in the rich region of Breadalbane, about Killin and Ben Lawers, and in the districts round Perth and Blair Atholl. The parts of the county which are difficult of access appear to have been almost entirely neglected. Our own work in the county dates back only ten years, but in that period we have made many excursions and collected a large amount of material for examination, besides making numerous notes in the field. The lichenologist, in making his investigations, is subject to limitations not felt by the student of phanerogams, or even by the bryologist. Many lichens are small and inconspicuous, and cannot be determined with certainty at sight, a careful microscopical examination being required. In the case of some species the chemical reaction of the thallus must also be ascertained. When collecting crustaceous species which grow on rocks much valuable time is often spent in chipping off suitable specimens with hammer and chisel. Moreover, some species

have a habit of growing on large flat surfaces of granite or other hard rocks, when it is almost impossible to obtain a specimen at all. Other species, again, which grow on young living bark cannot be obtained without injury to the tree or branch. As in the case of other plants, small differences in aspect, amount of moisture, or chemical composition of the substratum, give a totally different association of species; and if the lichenologist is prepared to do justice to the small plants, he can sometimes profitably spend hours in examining—pocket lens in hand—a few score yards of rock. There is, therefore, practically no limit to the time that may be spent in exploring one of the higher mountains; and when one considers that there are in Perthshire over seventy summits rising above 3000 ft., not to mention the wide stretches of moorland and rugged highland glens, often richly wooded in their lower parts, it is evident that much work will be required before the details of the lichen flora are really well known. Almost the whole county is, in fact, a paradise to the lichenologist, for we have in Perthshire a wonderfully rich variety of conditions suited to lichen growth. The only notable feature, indeed, which tends to limit the number of species is the absence of rocky sea-coast. The estuary of the Tay, with its low, flat, alluvial shore-line, presents few suitable habitats for maritime species. Before proceeding further, it may be well to give a short sketch of the physical and climatic features of the county.

Topography and Physiographical Features.

Perthshire is situated between the 56th and 57th parallels of latitude and about in the centre of Scotland, of which country it forms the fourth largest county, the area being 2494 square miles. It measures about seventy miles in its greatest length from east to west, and fifty-six miles from north to south. With the exception of the low-lying portion, known as the Carse of Gowrie, bordering the Firth of Tay, it is entirely an inland county. Perthshire may be naturally divided into two distinct parts—namely, the Highland region, which forms the north-western portion, and the Lowland region, which forms the south-eastern part. The Grampian Mountains, which correspond to the Highland portion of the county, enter it at the north-east corner, where they form the northern boundary line of the shire. As we proceed westwards they spread further and further into the county till they practically occupy the whole of it from north to south. The Lowland division is thus broadest in the north-east, and when traced westwards passes almost entirely out of the county. This Lowland tract is, however, traversed from north-east to south-west by two ranges of hills of moderate height—the Sidlaws to the east of the Tay and the Ochils to the west.

In the Highland region the mountains rise to an average elevation of 3000 ft., whilst many peaks exceed 3500 ft. The principal of these are Ben Lawers (3984 ft.), Ben More (3843 ft.), Ben Alder (3757 ft.), Ben Laoigh (3708 ft.), Ben-y-Gloe (3671 ft.),

Schiehallion (3547 ft.), and Ben Haesgarnich (3530 ft.). The highest summits of the Ochil Hills within the county are Blairdenon Hill (2072 ft.) and Core Hill (1780 ft.), whilst the Sidlaw Hills average about 1000 ft. only, King's Seat (1235 ft.), Black Hill (1182 ft.), and Kinnoull Hill (729 ft.).

As indicated above, the line of demarcation between the Highlands and the Lowlands passes diagonally across the county in a north-east and south-west direction, and corresponds to the line of a great geological fault which we shall refer to again later on. It may be traced from near Alyth, by Birnam, Comrie, and Callander to Aberfoyle. The region between this line and the Ochil and Sidlaw Hills forms the broad and fertile valley of Strathmore.

With the exception of a small portion of the extreme west of Perthshire, drained by the river Falloch, the water from which flows to the west coast by way of Loch Lomond, the whole of Perthshire is drained by the rivers Tay and Forth, which discharge their waters to the North Sea. Of these by far the most important, so far as the county under consideration is concerned, is the Tay. This fine river, the longest in Scotland, has a course of over one hundred miles, and with its numerous large tributaries, all of which flow through long and beautiful glens, has a drainage area of nearly 2000 square miles, or four-fifths of the total area of Perthshire. It rises on Ben Laoigh at the boundary of Argyllshire, and after a course of fifty-five miles, during which it passes through Loch Tay, it is joined by a stream of almost equal volume—the river Tummel, from the Moor of Rannoch and Loch Ericht. Other well-known tributaries of the Tay are, on its left bank, the Lochay, the Lyon, and the Isla, and, on its right bank, the Bran, the Almond, and the Earn.* The chief Perthshire streams which discharge to the river Forth are the Devon, which rises on the Ochil Hills, and the Teith, from Loch Katrine and Balquhidder. Many of these Perthshire rivers flow during some parts of their course through beautiful lakes. The largest are Loch Tay, Loch Earn, and Loch Rannoch in Breadalbane; Loch Ericht on the confines of Perthshire and Inverness; and Lochs Katrine and Venachar in the well-known district called the Trossachs.

The population of Perthshire in 1911 was 124,339, of which 36,669 are contained in the town of Perth. The towns of Crieff and Dunblane account for a further 10,680. Large areas of the county are very thinly populated, and some extensive tracts, as previously stated, are quite uninhabited. Of the total area, 1,596,160 acres, only about 340,000 acres are, more or less, cultivated. Over 90,000 acres are at present covered with wood, but more than double this area is said to be suitable for afforestation. By far the largest proportion of the county—over one million

* A further well-known Perthshire river which should be mentioned is the Garry, a tributary of the Tummel. This stream issues from Loch Garry, and after receiving the drainage from the Forest of Atholl flows through the famous Pass of Killiecrankie.

acres—consists of mountain pasture and moorland. A fairly large tract in the valley of the Forth, about the Lake of Menteith, was formerly covered by lowland peat bog, and of this a considerable area still remains. Drainage, however, is steadily reducing its size, and very little is left entirely unaltered in character.

Climate.

Although the climate of Perthshire varies considerably in different parts it may, as a whole, be described as mild, especially in the south of the county. The mean temperature at Perth for the whole year is about 47° F. The coldest month is January (36·5° F.), and the warmest July (59° F.) In the south-eastern parts of the county, and in the central valley, the range of temperature, however, is much more pronounced and continental in character than in the west and north-west. In the east the summers are warm and the winters rather severe, whilst in the west the temperature is more equable. This difference is largely caused by the greater cloudiness and heavier rainfall throughout the year in the west as compared with the east. Cloud in winter, by reduction of radiation, causes mildness, and similarly a dull sky in summer, by cutting off the sun's rays, produces coolness. The temperature in summer about Coupar Angus, and in the valley of Strathmore generally, often equals or exceeds that experienced in the warmer parts of the North of England, whilst in winter in the same region the minimum temperatures are almost as low as those found anywhere in Great Britain.

As regards protection from wind, a large portion of Perthshire is particularly favoured, the high mountains in the west producing an effective screen from the strong winds and gales from the Atlantic. Many of the glens are especially sheltered, as is evidenced by the finely grown timber and also by the luxuriant growth of evergreen trees and shrubs which will not bear exposure to these winds. Similarly the hills of Forfarshire and East Perthshire screen the county from winds from the North Sea. The summits and ridges of the higher mountains are, of course, very exposed and wind-swept, and are subjected to a bleak and arctic climate. Several summits come within the super-arctic zone of Watson. During the winter the snow is often almost completely blown off into the hollows and corries, leaving the exposed crags and highest rocks little or no protection from the rigorous conditions which prevail. It is here that some lichens seem to be most at home, especially members of the genus *Gyrophora*.

Turning to the consideration of rainfall we find, as would be expected, an extraordinary difference between the east and the west. The latter region being very mountainous, and situated on the great watershed of Scotland, it receives a full share of the exceedingly heavy precipitation produced when cyclonic winds are blowing in from the Atlantic. Further to the east these winds are descending currents, and having now been deprived of

much of their moisture by the mountains they become, by compression and consequent liberation of heat, drier and drier as they approach Strathmore. The annual rainfall about Perth and Coupar Angus only equals about 30 in., whilst at Loch Katrine it is 78 in., and in some of the mountain glens round Ben More and Ben Laoigh it equals or exceeds 100 in. With easterly winds, on the contrary, the west of Perthshire is relatively dry, the heaviest rainfall then being found in the eastern upland region about Glen Shee and Strath Ardle.

The amount of snowfall on the mountains is often very great, the depth of snow generally increasing until the end of April. Even in June the higher corries facing north frequently contain large masses which persist until the beginning of July, and occasionally longer.

The variation in the amount of rainfall in different parts of the county would appear to have a marked effect on the distribution of certain lichens. The relative rareness in the west, for instance, of most species of *Alectoria*, as compared with the east, is a noticeable feature; whilst, on the other hand, members of the *Sticta* group attain a great luxuriance in the wooded glens of the west, and are either absent from or very poorly developed in similar situations in the east.

A word may here be said with regard to the injurious effect of atmospheric pollution on Perthshire lichens. No part of the county comes within the manufacturing district of the Scottish Lowlands, of which great smoke-producing area the towns of Motherwell and Coatbridge are familiar examples; but when southerly winds are blowing, the smoke from this district forms a dull, leaden haze over all South Perthshire. Even in the extreme north of the county it renders the distant landscape indistinct, when otherwise it would be clear. The effect of the smoke on bark-loving lichens is, unfortunately, quite noticeable about Rumbling Bridge and Dunblane, and in a less degree further north. The trunks of trees in exposed places are almost naked, such common species as *Evernia prunastri* and *Parmelia physodes* being small and poorly developed. Lichens which grow on rocks and walls also show diminution of size, but to a less extent. Happily we have observed no signs of injury in the central and northern parts of the county.

Geology.

In the following short sketch of the geology, we do not propose to do more than simply indicate in a general way the position and outcrop of the various rocks, a detailed description of the geological structure being out of place here, and quite unnecessary from the point of view of the lichenologist.

As before stated, Perthshire is divided naturally into two portions—the Highlands and the Lowlands—the division being marked by a great geological fault which traverses the county from north-east to south-west. Along this line the ancient crystalline schists, of which the Highlands are largely composed,

give place to the younger Palæozoic rocks of Strathmore, the down-throw of strata amounting to many thousands of feet. In the latter region the rocks consist for the most part of conglomerates, shales, and sandstones belonging to the Old Red Sandstone formation; but these are traversed in places by dykes of dolerite—a coarse-grained variety of basalt. The Sidlaw and Ochil Hills are almost entirely composed of volcanic rocks of Old Red Sandstone age. They consist of beds of lava and volcanic ash—porphyrite, dolerite, tuff-aglomerate, &c.—most of which beds are very hard and weather very slowly. These hills are, however, much rounded in outline, the result of glacial action, ice-worn surfaces occurring even on their highest summits. When cliffs are seen they are generally in places where the surface has not been exposed to the grinding action of the ice. In the Highland area of Perthshire we have a large series of very ancient rocks, many of them metamorphic, and composed of quartzite, quartz-schist, slate, limestone, &c., with intrusions of basalt, porphyrite, felsite, diorite, and granite. Commencing at the great boundary fault and proceeding northwards, we have first a narrow band of shales, grits, and cherts, supposed to belong to the Upper Cambrian system. They extend from the west of Aberfoyle to the east of Callander. Then we have the Leny schistose grit and the Birnam and Aberfoyle slates. Northwards again there is a broad band of quartz-schist, which extends from Loch Chon to the Forest of Alyth, and forms the rugged mountain masses of Ben Venue, Ben Ledi, Ben Vorlich, and Ben Chonzie. Next comes the mica-schist rock of Ben More, which, with hornblende, forms most of the high ground north-eastwards to Balinluig and Strath Ardle. Then we have the calcareous schist which forms the lower hills on the north side of Loch Tay, followed by the garnetiferous schists, and after these the well-known calcareous sericite schist. This is the famous rock which, by reason of its chemical composition and its property of rapid weathering into numerous rock ledges, small crevices, and glittering sandy detritus, produces the wonderfully rich arctic-alpine flora of Breadalbane. It extends from Meall-na-Saone to Craig Caillich and Ben Lawers, reappearing further east on Farragon Hill, and also on Ben-y-Vrackie and in Glen Shee. It also largely composes the mountains near the head of Glen Lochay, namely, Creag Mhor, Ben Heasgarnich, and Cam Chreag. Another variety of mica-schist is the graphitic, or black schist, which occurs on the north-east side of Ben Lawers. This rock, together with a complicated series of quartz-schists and limestones, extends to the country to the east of Blair Atholl.

The central highlands about Loch Rannoch, and most parts of the Forest of Atholl, are composed of quartzites and quartz-schists. Intrusions of felsite also occur, especially in Glen Garry. The fine peak of Schiehallion consists of quartzite. On Rannoch Moor we have a large area of granite, a good deal overlaid, however, with moraine gravel and beds of peat. Granite is also found on the mountains to the south-east of Loch Ericht,

in Glen Lednoch to the south of Ben Chonzie, in Glen Shee, and elsewhere. Diorite, felsite, basalt, and other obtrusive igneous rocks also occur in various places. In the valley of the Forth, above Stirling, there is a considerable area of alluvium, as also in Strath Dochart, above Killin. Almost all parts of the county show evidences of extensive glaciation, the rock surfaces in the valleys, and even high up the mountain-sides, being rounded and smoothed in the direction traversed by the ice. The slopes and floors of the valleys are often covered with boulder clay and large deposits of gravel, either morainic or brought down by streams. Travelled boulders occur almost everywhere. Many of these, composed of mica-schist from the Highlands, have been carried across the valley of Strathmore and deposited on the sides and summits of the Ochils and Sidlaws. They often have growing upon them lichens characteristic of the locality from which they came, and where the rock occurs *in situ*. It is of course not to be supposed that the lichens came along with the boulders, but rather that these plants were derived from spores, carried there in more recent times by the wind or other agencies, and which found upon the stones the special conditions suited to their growth.

Plant Associations.

Lichens occupy a very subordinate position in the majority of the associations defined by plant geographers. Their presence is usually determined by conditions that have not been of primary importance in influencing the succession of the plant community, and consequently they play an insignificant part in the evolution of the dominating groups of higher plants. The few formations in which they are essential constituents of the vegetation belong to the less firmly established series denominated by Crompton "migratory plant formations." In these they have more importance, and in combination with other lowly cryptogams—algæ, mosses, and hepatics—form vital links in the chain of succession, and are sometimes the dominant species. The Dune Formation of sea coasts (not represented in Perthshire) provides an excellent illustration. A parallel and even more interesting example is afforded by the Arctic-Alpine Formation, in which at least one association is completely dominated by lower cryptogams. This will be referred to later.

In the more stable plant communities, the lower cryptogamic vegetation is almost entirely accessory and dependent, and so we find some of the species generally distributed, and appearing in very diverse plant formations. In endeavouring to broadly indicate the distribution of the lichens through so large an area, we have realised that this cannot be done effectively without the help of a larger number of workers. The difficulty of determining lichens in the field makes it a matter of impossibility to give complete lists, and we have obtained but little help from published works by plant geographers. We have adopted the grouping of formations proposed by W. G. Smith, dividing the county

into three climatic zones, which he designated as follows:—1. The zone of cultivation and pasture. 2. The zone of closed moorland associations. 3. The zone of Arctic-Alpine vegetation. These apparently correspond to Schimper's lowland, montane, and alpine belts of temperate climates, and H. C. Watson's Agrarian and Arctic Zones.

1. *Zone of Cultivation and Pasture.*—This zone embraces all the lowlands, and terminates in a very irregular line, usually between the 900 ft. and 1200 ft. contours. It follows roughly the limit of corn cultivation and of *Pteris* in exposed situations, ascending highest in the east of the county. The largest extent is around Perth, but it occupies all the principal straths, such as More, Tummel, and Tay, and borders the courses of the chief rivers, extending in places a considerable distance up the glens. In this zone the influence of man reaches its maximum effect on the flora, and the natural plant formations are sometimes difficult to trace. Building, draining, planting, and the introduction of flocks and herds have profoundly altered the condition of the vegetation. Peat-bogs—never of great extent, perhaps, except in the district of Monteith—have been reduced, and frequently cut up and drained. Such as remain yield the following species characteristic of peat-bogs:—*Bæomyces æruginosus*, *Cladonia pityrea*, *C. cornuta*, *C. cervicornis*, *C. trachyna*, *C. coralloidea*, *C. furcata*, *C. racemosa*, *C. crispata*, *C. squamosa*, *C. coccifera*, *C. pleurota*, *C. bacillaris*, *C. Floerkeana*, *Cladina rangiferina*, *C. impexa*, *C. sylvatica*, *C. alpestris*, *C. uncialis*, *Cetraria aculeata*, *Lecidea glaucolepidea*, *L. granulosa*, and *L. uliginosa*.

The nitrophilous lichens are more prevalent in this lower zone than in the others. They probably originally inhabited maritime rocks, where the spray was charged with the wreckage of the marine fauna and the dung of sea-fowl. They now find a satisfactory food supply in the neighbourhood of highly cultivated fields and by dung-strewn roads, where blown dust containing nitrogenous matter falls upon the plants. They often occur abundantly on walls, rocks, and tree-trunks near farm buildings and villages, and on trees in orchards and gardens. Amongst them are probably to be included the following:—*Xanthoria parietina*, *X. lychnea*, *Physcia tenella*, *P. pulverulenta*, *P. aipolia*, *Placodium murorum*, *P. tegulare*, *P. sympageum*, *Callopismum citrinum*, *C. vitellinum*, *C. laciniosum*, *C. ferrugineum*, *C. pyraceum*, *Lecanora circinata*, *L. galactina*, *L. atra*, *Buellia canescens*, and probably some other species of *Buellia*. On roadside banks *Cladonia pyxidata*, *C. fimbriata*, and *C. cæspititia* often grow very freely, and they also may be somewhat nitrophilous, and, as pointed out by W. West, some *Parmeliæ* are more abundant and luxuriant on roadside trees and walls than elsewhere.

The woodlands form an important feature of this zone. We have not attempted to define the lichens of the different types of woods. In all woods the lichens are most numerous in species and also in individuals (with the exception, possibly, of *Usnea*

hirta) in open clearings or on the outskirts. A much greater variety occurs on trees in glades or park-like spaces than in the shade of dense wood-canopy. On trees in the former situations may be found:—*Ramalina fraxinea*, *R. fastigiata*, *R. calicaris*, *R. farinacea*, *Evernia prunastri*, *Parmelia perlata*, *P. caperata*, *P. saxatilis*, *P. sulcata*, *P. fuliginosa*, *P. physodes*, *Physcia pulverulenta*, *P. stellaris*, *P. aipolia*, *P. adglutinata*, *Lecanora varia* and its subspecies, *L. albella*, *L. tartarea*, *L. parella*, *Pertusaria communis*, *P. amara*, *Biatorina cyrtella*, *B. graniformis*, *Buellia disciformis*, *B. myriocarpa*, *B. canescens*, *Lecidea parasema*, *Opegrapha atra*, *O. varia*, *O. vulgata*, *Graphis elegans*, *Graphina anguina*, *Acrocordia gemmata*, *Arthopyrenia epidermidis*, *A. cinereopruinosa*, and *A. fallax*. In dense woods, as the shade increases, the species gradually disappear, those which ultimately survive being *Usnea hirta*, *U. dasypoga*, *Lecanora varia* ff, *Biatorina premnea*, *Lecidea effusa*, *Opegrapha atra*, *Graphis elegans*, *G. scripta*, *Arthonia radiata*, and *Pyrenula nitida*.

On the trunks of solitary trees in still more open situations, as in hedgerows, fields, and parks, the following are conspicuous species:—*Ramalina fraxinea*, *R. calicaris*, *Parmelia saxatilis*, *P. exasperata*, *Xanthoria parietina*, *P. fuliginosa* var. *lætevirens*, *Pertusaria communis*, *P. amara*, and particularly the various species of *Physcia*, few or none of which occur in shady woods.

The corticole flora attains its maximum richness in moist, sheltered valleys protected from wind, such choice localities frequently being where open woodlands, under the shelter of mountains, debouch on the shores of lakes—as at the head of Loch Tay, and by Loch Earn, Loch Katrine, and Loch Rannoch. The lichens here form a very typical lacustrine plant community, characterized by the presence of the large foliaceous *Stictineæ*, associated with bark-loving *Pannarii*. In addition to many of those enumerated above, the following occur in this group:—*Collema terrulentum*, *C. flaccidum*, *Synechoblastus nigrescens*, *S. aggregatus*, *S. fasciculare*, *Leptogium Burgessii*, *L. saturninum*, *Platysma glaucum*, *Ramalina farinacea*, *Parmelia ciliata*, *P. cetrarioides*, *P. physodes* (sometimes fruiting), *Stictina Thourasii*, *S. fuliginosa*, *S. limbata*, *Lobarina scrobiculata*, *Lobaria pulmonaria*, *Ricasolia amplissima*, *R. lætevirens*, *Nephromium lusitanicum*, *N. parile*, *N. lævigatum*, *N. subtomentellum*, *Peltigera scutata*, *Physcia polycarpa*, *P. venusta*, *Pannularia triptophylla*, *Pannaria rubiginosa*, *P. rubig.* var. *cæruleo-badia*, *Coccocarpia plumbea*, *Lecanora allophana*, *L. rugosa*, *L. chlarona*, *L. intumescens*, *L. lutescens*, *L. effusa*, *Pertusaria amara*, *P. communis*, *P. leioplaca*, *Thelotrema lepadina*, *Lecidea minor*, *L. parasema*, *Biatorina erysiboides*, *B. globulosa*, *B. premnea*, *Bacidia arceutina*, *Buellia disciformis*, *Leciographa plumbina*, *Arthonia radiata*, *Opegrapha vulgata*, *Normandina pulchella*, *Arthopyrenia punctiformis*, and *Acrocordia biformis*. The lichenologist must not overlook the lignicole species which occur naturally on dead and decorticated tree-trunks. In the zone under consideration, in

which artificial enclosures are numerous, these lichens multiply exceedingly on the many suitable habitats provided by old gate-posts, palings, barn-doors, and other worked wood. Such lignicole species are the following:—*Calicium chrysocephalum*, *C. curtum*, *C. elassosporum*, *Usnea hirta*, *Platysma diffusum*, *P. glaucum*, *Evernia furfuracea*, *Parmelia fuliginosa*, *P. physodes*, *Callopisma vitellina*, *Lecanora symmictera*, *L. sarcopis*, *L. Hageni*, *L. metabolioides*, *L. subintricata*, *Rhinodina exigua*, *Cladonia delicata*, *C. macilenta*, *Lecidea albohyalina*, *L. parasema*, *L. aniptiza*, *L. fucata*, *Biatorella moriformis*, *Biatorina synothea*, and *Buellia disciformis*.

The ground vegetation of the woodlands often carries so dense a crop of herbaceous plants that lichens are crowded out. Mossy knolls and rocks, decaying stumps, and shady banks yield *Peltigera canina*, *P. polydactyla*, *P. rufescens*, *P. horizontalis*, *P. aphthosa*, *Cladonia pyxidata*, *C. fimbriata*, *C. asperella*, *C. fibula*, *C. cenotea*, *C. subsquamosa*, *C. delicata*, *C. digitata*, *C. macilenta*, *Lecidea flexuosa*, and *L. fuliginosa*.

The rupestral lichens of this lower zone have not yet been adequately studied. They cannot be classed satisfactorily in the groups into which the higher plants have been divided. A given district may contain whole lichen communities which owe their presence to edaphic factors quite different from those to which the surrounding flora owes its origin. Scattered erratic boulders, and even small stones, will often yield quite unexpected species, producing a very mixed lichen-flora. For example, in the district west of the rivers Garry and Tummel erratic siliceous blocks of grey hornblende-granite, originating on Ben Alder and Rannoch Moor, are widely scattered, and are sometimes perched on calcareous strata, and, as already described, travelled boulders of mica-schist from the Highlands occur on the volcanic rocks of the Sidlaw and Ochil Hills. Then there are the walls, which often support a lichen-flora alien to that of the surrounding district. In fact they present a unique feature to the lichenologist, and some species have only been found on them, although the plants must have migrated to them originally from some natural situation. Mortared walls often carry a calcicole lichen-flora into areas devoid of calcareous rock. The following species have been noticed on mortar, plaster, or concrete of walls, buildings and bridges:—*Collema furvum*, *C. flaccidum*, *C. pulposum*, *C. crispum*, *C. granuliferum*, *C. cristatum*, *Collemodium Schraderi*, *Leptogium scotinum*, *Xanthoria parietina*, *Physcia ulothrix*, *Placodium murorum*, *P. sympageum*, *Callopisma citrina*, *Lecanora circinata*, *Acarospora pruinosa*, *Urceolaria scruposa*, *Bilimbia aromatica*, *B. sabuletorum*, *Buellia canescens*, and *Verrucaria muralis*.

Unmortared walls are very common, and provide a great variety of rock and aspect. They also allow free passage of air and rapid drainage, features not always obtainable on natural rocks. In these respects they approach most closely to that class of scree-slopes termed "block-scree." No attempt has been

made to draw up lists of species for the various classes of rocks met with in this zone, either in natural or artificial situations. They will be found to some extent indicated in the list of species.

Attention may also be drawn to a group of species found usually on the damp, shaded rocks of ravines, or on large boulders by streams and near waterfalls. They form a community of shade-loving chomophytes in association with a number of mosses and hepatics, the constituents varying with the kind of rock.

Amongst the species may be included:—*Collema flaccidum*, *C. furvum*, *Synechoblastus multipartitum*, *Pilophorus cereolus*, *Stictina fuliginosa*, *S. sylvatica*, *Peltidea aphthosa*, *Solorina saccata*, *S. spongiosa*, *Peltigera rufescens* var. *prætextata*, *P. horizontalis*, *Pannaria nebulosa*, *P. brunnea*, *Leproloma lanuginosa*, *Hæmatomma coccinea*, *Cœnogonium ebeneum*, *Racodium rupestre*, *Gyalecta cupularis*, *Bacidia flavovirescens*, *Opegrapha zonata*, *Porina lectissima*, *Verrucaria nigrescens*.

Of more decided hydrophyllous tendency than the above there are a few species which share the bed of the stream with such aquatic bryophytes as *Cinclidotus*, *Grimmia apocarpa*, *Fontinalis*, *Hyocomium*, and *Scapania*. The rocks on which they grow are liable to be submerged for long periods, or in drier weather they may be fully exposed. The lichens, however, withstand desiccation without apparent injury. These amphibious lithophytes are represented by *Lichina Kenmorensis*, *Collema fluviatile*, *Aspicilia lacustris*, *A. epulotica*, *Bacidia inundata*, *Rhizocarpon lavatum*, *R. petræum*, *Lecidea contigua*, *L. albocærulescens*, *Dermatocarpon miniatum* var. *complicatum*, *D. aquaticum*, *Verrucaria lævata*, *V. æthiobola*, and *V. margacea*. Some of these come down with streams from the higher zone.

II.—*The Zone of closed Moorland Associations*, which may be more briefly termed the subalpine zone, embraces all the hilly district between that already considered and the arctic-alpine zone. It occupies a large proportion of the surface of Perthshire, and has been only very imperfectly explored. In the lower parts there are tracts of heathland, which, where the soil lies thinly over the subjacent rocks, often extend downwards into the agrarian zone. These heathlands of lower altitudes do not, however, coincide in their general flora with those of the English heaths, and certainly, so far as their lichen-flora is concerned, may for the present be classed with the more subalpine groups. According to W. G. Smith, Scottish heathland may be divided into three associations, *viz.* those of Pinewoods, Birchwoods, and *Calluna* moor. Above the latter, large tracts of grass-moor lead up to the arctic-alpine zone.

The facies of the lichen-flora of the Pinetum is strikingly different from that of the deciduous woods, and the list shows a considerable number of species peculiar to it. Some of the pinewoods are believed to be natural, but in the majority of instances the trees are planted. In these latter woods spruce and larch trees present a similar flora to that of the native pine. The pine-

woods of Rannoch would repay more detailed examination than was allowed by the brief time we spent on its fringe in very wet weather. The following are the corticole species of this association:—*Calicium curtum*, *C. hyperellum*, *C. chrysocephalum*, *Usnea hirta*, *U. dasypoga*, *U. ceratina*, *Alectoria jubata*, *A. subcana*, *A. implexa*, *Platysma glaucum*, *P. ulophyllum*, *P. juniperinum*, *P. pinastri*, *Physcia polycarpa*, *Evernia prunastri*, *E. furfuracea*, *Parmelia saxatilis*, *P. sulcata*, *P. physodes*, *P. fuliginosa*, *P. subaurifera*, *P. exasperata*, *Parmeliopsis ambigua*, *P. aleurites*, *Lecanora piniperda*, *L. varia*, *L. conizæoides*, *L. lutescens*, *Pertusaria ophthalmiza*, *Gyalecta corticola*, *Cladonia macilenta*, *Lecidea ochrococca*, *L. granulosa*, *L. flexuosa*, *L. sanguinaria*, *Biatorella resinæ*, *Biatorina diluta*, and *Melaspilea lentiginosula*.

On decorticated trunks and fir palings occur *Platysma ulophyllum*, *P. pinastri*, *Evernia prunastri*, *Parmelia aleurites*, *P. physodes*, *Lecanora coilocarpa*, *L. varia*, *L. lutescens*, *Lecidea fuliginea*, *L. perobscura*, *L. turgidula*, *L. misella*, *L. ochrococca*, *L. enclitica*, *L. sanguinaria*, *Biatorina spodiza*, *Xylographa parallela*, and *X. laricicola*.

The Betuletum or subalpine birchwood ascends higher than the pinewood, and its lichen-flora is less specialized. The principal species are *Alectoria jubata*, *A. subcana*, *Ramalina calicaris*, *Pamelia physodes*, *Nephromium lusitanicum*, *Stictina sylvatica*, *Lobarina scrobiculata*, *Lecanora allophana*, *L. tartarea*, *L. chlarona*, *L. intumescens*, *L. albella*, *Pertusaria amara*, *P. leioplaca*, *Lecidea parasema*, *Buellia disciformis*, *Biatorina Lightfootii*, *Arthopyrenia epidermidis*, *A. cinereo-pruinosa*, *Leptorhaphis epidermidis*. The mountain ash yields, amongst other species, *Ptychographa xylographoides*.

The ground-flora of birch and pinewoods in upland districts differs but little from that of the adjacent heaths. The species of lichens which occur differ only from the heathland ones in the proportions in which they are mingled, and therefore we can consider them with the other ground-dwelling species.

The upland heathlands consist of calluna-moor and grass-moor, the latter being considerably the more extensive of the two. The lichen-flora of the former approaches in its constituents that of the peat-bog, but contains a greater variety of species. On much of the grass-moor lichens are crowded out, except on the numerous stones and boulders to be referred to later. Cladoniæ are fewer, and other terricole species are such as occur amongst the frequent tussocks of the larger mosses. The following are the principal species of the subalpine heathlands occurring on the ground or on banks amongst mosses:—*Homodium tenuissimum*, *Leptogium lacerum*, *L. palmatum*, *Peltigera horizontalis*, *P. venosa*, *P. canina*, *P. polydactyla*, *Cetraria islandica*, *C. aculeata*, *Parmelia physodes*, *Psoroma hypnorum*, *Lecanora epibryon*, *L. tartarea*, *Aspicilia verrucosa*, *Urceolaria bryophila*, *Bæomyces rufus*, *B. placophyllus*, *B. roseus*, *Icmadophilus æruginosus*, *Pycnothelia papillaria*, *Cladonia gracilis*, *C. verticillata*, *C. cervicornis*, *C. sobolifera*, *C. degenerans*, *C. trachyna*, *C. coralloidea*, *C. lepidota*, *C. furcata*,

C. racemosa, C. crispata, C. squamosa, C. coccifera, C. pleurota, C. deformis, C. Floerkeana, Cladina rangiferina, C. sylvatica, C. alpestris, C. uncialis, C. amaurocræa, Gyalecta foveolaris, Lecidea coarctata, L. granulosa, L. uliginosa, L. Templetoni, L. neglecta, Biatorina contristans, Bilimbia sabulosa, B. ligniaria, B. melæna.

In Perthshire the zone under consideration provides a rich variety of saxicole lichens. The lists here given must not be regarded as complete, and at present we can only divide the rock-habitats into three very broad types. Much further study is needed as to the distribution of saxicole lichens.

Many of the species in the following lists for the subalpine zone occur in the zones both above and below, but it is thought best to include them so as to show a more complete view of the lichens the botanist may expect to find on each class of rock.

On calcareous rocks, especially on limestone and mica-sericite, in dry exposed situations, have been found :—*Spilonema scoticum, Pterygium pannariellum, Physcia cæsia, Pannularia triseptata, Caloplaca erythrella, C. pyracea, Lecanora frustulosa, L. tartarea, L. subtartarea, L. parella, Pachyspora superiuscula, Aspicilia depressa, A. calcarea, A. subdepressa, A. poriniformis, A. Prevostii, Acarospora glaucocarpa, A. squamulosa, A. admissa, Psora lurida, P. lugubris, P. lugubrior, Lecidea leptostigma, L. immersa, L. subfurva, L. jurana, L. consentiens, L. contigua, L. cinerascens, L. lapicida, L. umbonella, L. nigrogrisea, L. segregans, Biatorella subnigrata, B. rhypodiza, Biatorina confusior, Rhizocarpon calcareum, Polyblastia inumbrata.* In moister places, or on damp, shady rocks, occur *Gonionema velutinum, G. compactum, Collema glebulentum, Leptogium rhyparodes, Collemopsis furfurella, Ionaspis epulotica, Rhizocarpon petræum, Staurothele umbrina.*

On siliceous rocks, or schists with a low lime-content, especially on quartzose-schists, the following may be looked for. On drier rocks of this class :—*Sphærophorus coralloides, S. fragilis, Usnea ceratina, Alectoria bicolor, A chalybeiformis, Platysma Fahlunense, P. commixtum, P. glaucum, P. lacunosum, Parmelia saxatilis, P. omphalodes, P. Mougeotii, P. prolixa, P. tristis, P. lanata, P. stygia, Gyrophora proboscidea, G. cylindrica, G. torrefacta, G. polyphylla, G. flocculosa, G. polyrrhiza, Squamaria saxicola, S. gelida, Lecanora glaucoma, L. epanora, L. polytropa, L. sulphurea, L. atra, L. badia, L. picea, L. tartarea, L. parella, Hæmatomma ventosa, Aspicilia Dicksonii, Pertusaria Westringii, P. dealbata, Stereocaulon denudatum, S. corallinum, Lecidea lucida, L. coarctata, L. goniophila, L. confluens, L. lithophila, L. albocœrulescens, L. cinerascens, L. subkochiana, L. fuscoatra, L. rivulosa, L. Kochiana, L. fuscocinerea, L. atrofuscescens, L. furvella, L. asperella, Biatorella chalybeia, Bilimbia leucophæoides, Bacidia umbrina, Buellia alpicola, B. colludens, B. badioatra, Rhizocarpon Ederi, R. confervoides, R. geographicum.*

In moister situations :—*Spilonema revertens, Pyrenopsis*

phylliscella, *Ephebe pubescens*, *Ephebeia hispidula*, *Pilophorus strumaticus*, *P. cereolus*, *Stictina crocata*, *Pertusaria lactea*, *Lecidea phæops*, *L. Bruyeriana*, *L. fuliginosa*, *L. contigua*, *L. albocærulescens* var. *alpina*, *Rhizocarpon obscuratum*, *Verrucaria margacea*. Some of these probably find their way down in the currents of streams from the subalpine zone.

On granitic and eruptive rocks the lichen-flora resembles that of siliceous rocks more than that of calcareous rocks. The commoner Parmeliæ and the Gyrophoræ flourish on them. The species are *Sphærophorus coralloides*, *S. fragilis*, *Alectoria bicolor*, *Platysma Fahlunense*, *P. commixtum*, *P. glaucum*, *P. lacunosum*, *P. saxatilis*, *P. omphalodes*, *P. Mougeotii*, *P. stygia*, *P. tristis*, *P. lanata*, *Gyrophora proboscidea*, *G. cylindrica*, *G. torrefacta*, *G. polyphylla*, *G. flocculosa*, *Squamaria gelida*, *Lecanora atra*, *L. badia*, *L. tartarea*, *L. parella*, *Hæmatomma ventosa*, *Aspicilia Dicksonii*, *A. cinerea*, *Acarospora peliocypha*, *Pertusaria dealbata*, *Stereocaulon Delisei*, *S. evolutum*, *S. coralloides*, *S. denudatum*, *Lecidea lugubris*, *L. inserena*, *L. panæola*, *L. contigua*, *L. confluens*, *L. lapicida*, *L. plana*, *L. mesotropa*, *L. auriculata*, *L. diducens*, *L. aglæa*, *L. rivulosa*, *L. Kochiana*, *L. pycnocarpa*, *Buellia atrata*, *Rhizocarpon Œderi*.

III. *The Arctic-alpine Zone*.—Dr. W. G. Smith has defined the associations of this zone in *British Vegetation*, so far as the higher plants are concerned, and the lichens of a limited tract on Ben-y-Gloe were enumerated by the authors in *Journal of Botany*, Sept. 1914, p. 227. For fuller descriptions of the influences affecting the vegetation the reader is referred to those papers. Dr. Smith recognises two principal formations, those of "Mountain Top Detritus" and of "Crags and Corries." Cryptogamic vegetation plays an important rôle in all the minor associations into which these formations are subdivided. In the first formation, five associations may be distinguished, but they intergrade considerably, and are often difficult to recognise in broken areas, where every yard seems to introduce new combinations. The Moss-Lichen Association occupies large areas on granitic and quartzite mountain summits, but on schistose rocks, such as occur on Ben Lawers, the open associations are more limited in extent, the weathering rock rapidly filling in the instertices, and allowing the plant-covering to become continuous. This association on the various Perthshire summits includes the following lichens:—

Euopsis granatina, *Sphærophorus coralloides*, *S. fragilis*, *Gyrophora polyphylla*, *Parmelia saxatilis*, *P. omphalodes*, *P. lanata*, *P. stygia*, *P. alpicola*, *P. vittata*, *Cetraria aculeata*, *C. crispa*, *C. islandica*, *Platysma triste*, *P. nivale*, *Lecanora tartarea* var. *frigida*, *L. upsaliensis*, *L. gemmiparum*, *Aspicilia oculata*, *Pertusaria dactylina*, *P. glomerata*, *Stereocaulon denudatum*, *S. tomentosum*, *S. alpinum*, *Cladonia coccifera*, *C. gracilis*, *C. racemosa*, *C. uncialis*, *C. destricta*, *Lecidea arctica*, *L. limosa*, *L. alpestris*, *L. demissa*, *L. uliginosa*, *L. cuprea*, *L. Berengeriana*, *L. cupreiformis*, *L. atrofusca*, and many of the Lecideæ from the

Chomophyte formation, on the small stones with which this class of ground is usually strewn.

The second Association is the Closed Rhacomitrium Heath—really the final stage of the preceding—in which *Rhacomitrium lanuginosum* is the dominant plant. We may unite with this the third Association, or the Moss-Lichen Moor. This is practically a combination of the sub-alpine moorland flora with that of the *Rhacomitrium* heath, knolls and patches of the latter everywhere chequering the surface. The lichen-flora is well illustrated by the list given in our paper on Ben-y-Gloe vegetation (*loc. cit.*), to which may be added:—*Cladonia digitata*, *Biatorina cumulata*, *B. contristans*, *B. ligniaria*, *Bilimbia subviridescens* var. *trisepta*, *Buellia disciformis* var. *insignis*, and perhaps *Dermatocarpon cartilagineum*.

The fourth or Anthelia Association, occurring in hollows where snow lies, or where the soil is kept wet and cold by water draining from melting drifts; and the fifth or Marsupella Association, of exposed mountain shoulders with a northern aspect, have not yet, as regards their lichen constituents, been carefully studied. Their constituent species are very similar, and they may be listed together until further study has drawn a clearer line of demarcation between them. The species are:—*Cetraria crispa*, *Peltigera venosa*, *P. polydactyla*, *Solorina crocea*, *Pannularia lepidiota*, *Lecanora tartarea* var. *frigida*, *Pertusaria glomerata*, *Cladonia bellidiflora*, *C. cervicornis*, *C. gracilis*, *C. furcata*, *Cladina uncialis*, *C. sylvatica*, *Gyalecta foveolaris*, *Lecidea decipiens*, *L. granulosa*, *L. demissa*, *L. vernalis*, *L. cuprea*, *L. Berengeriana*, *Bilimbia sabulosa* var. *montana*, *B. squalida*, *Coriscium viride*, *Dermatocarpon cinereum*, *Polyblastia Sendtneri*, *P. gelatinosa*, *P. nigritella*, *Arthopyrenia bryospila*, and *A. colleta*, in addition to a number of Lecideæ occurring on rock *débris* derived from the next formation.

The Chomophyte formation of Crags and Corries is, perhaps, the most interesting, as it is the most alpine, of the series. Its rich phanerogamic and bryophytic flora has attracted most British botanists sooner or later to Perthshire. The lichens are not less rare and local.

The more calcareous rocks and schists yield the following at similar high altitudes:—*Euopsis hæmalea*, *Pyrenopsis hæmatopus*, *P. homœopsis*, *P. furfuracea*, *Collema granuliferum*, *C. glebulentum*, *Homodium rhyparodes*, *Leptogium pulvinatum*, *Collemopsis furfurellum*, *Pannaria Hookeri*, *P. triseptata*, *P. melantera*, *Leproloma lanuginosa*, *Lecanora Siebenhaariana*, *L. tartarea*, *Aspicilia alpina*, *A. superiuscula*, *A. leucophyma*, *A. cinereorufescens*, *A. pelobotrya*, *A. frustulosa*, *Pertusaria gyrocheila*, *Lecidea fuscorubens*, *L. deparcula*, *L. phæenterodes*, *L. contigua*, *L. cinerascens*, *L. plana*, *Buellia succedens*, *B. atrata*, *Rhizocarpon excentricum*, *R. postumum*, *Arthonia lapidicola*, *Polyblastia fuscoargillacea*, *Microglæna breadalbanensis*, *Thelidium pyrenophorum*, *T. papulare*, *Polyblastia intercedens*, *P. theleodes*, *P. scotinospora*, *P. Henscheliana*, *Staurothele umbrina*.

The Lithophytes, occurring on bare non-calcareous rocks and boulders, consist of the following species, all occurring on rocks above 2300 ft. altitude:—*Euopsis granatina*, *Pyrenopsis fuscatula*, *Ephebeia hispidula*, *Sphærophorus coralloides*, *S. fragilis*, *Platysma Fahlunense*, *P. commixtum*, *Parmelia omphalodes*, *P. saxatilis*, *P. stygia*, *P. lanata*, *P. triste*, *P. alpicola*, *Gyrophora cylindrica*, *G. erosa*, *G. arctica*, *G. polyphylla*, *G. hyperborea*, *Squamaria gelida*, *Hæmatomma ventosa*, *Lecanora picea*, *L. atra*, *L. polytropa*, *L. intricata*, *L. tartarea*, *L. subtartarea*, *Aspicilia epiglypta*, *A. gibbosa*, *Pertusaria dealbata*, *P. ceuthocarpa*, *P. concreta*, *P. Westringii*, *Stereocaulon condensatum*, *Lecidea nigroclavata*, *L. dealbatula*, *L. tabidula*, *L. lactea*, *L. glebulosa*, *L. Bruyeriana*, *L. sublatypea*, *L. leucophæa*, *L. nigroglomerata*, *L. tabidula*, *L. jurana*, *L. consentiens*, *L. panæola*, *L. phæenterodes*, *L. sorediza*, *L. crustulata*, *L. confluens*, *L. cinerascens*, *L. tessellata*, *L. lapicida*, *L. lithophila*, *L. plana*, *L. lactea*, *L. auriculata*, *L. armeniaca*, *L. marginata*, *L. aglæoides*, *L. fuscoatra*, *L. griseoatra*, *L. assimilis*, *Buellia deludens*, *B. atrobadia*, *Biatorina rhypodiza*, *Biatorella Morio*, *Rhizocarpon confervoides*, *R. geographicum*, *R. postumum*, *R. obscuratum*, *Lithographa tesserata*, and *Microthelia exerrans*.

The following may be classed as Chasmophytes, growing on earth or mosses in chinks or on ledges, and very rarely indeed occurring on bare rock:—*Schizoma lichinodeum*, *Collema ceraniscum*, *C. tenax*, *Peltidea venosa*, *Solorina crocea*, *S. bispora*, *Pannularia brunnea*, *Pannularia delicatula*, *Phialopsis rubra*, *Lecanora rhypariza* var. *curvescens*, *Cladonia verticillata*, *C. cervicornis*, *C. macrophylla*, *C. squamosa*, *Lecanora nivalis*, *L. leptacina*, *Aspicilia oculata*, *Lecidea lurida*, *L. rubiformis*, *L. rhizobola*, *L. cupreiformis*, *L. epiphorbia*, *Biatorella fossarum*, *Biatorina candida*, *Bilimbia sabulosa*, *B. rhexoblephara*, *B. squalida*, *Bacidia flavovirescens* var. *alpina*, *B. oribata*, *Lopadium pezizoideum*, *L. fuscoluteum*, *L. fecundum*, *Dermatocarpon lachneum*, *D. hepaticum*, *Thelopsis melathelia*, *Dacampia Hookeri*.

Authorities Quoted and Abbreviations Used.

The principal published sources of records relating to Perthshire lichens are detailed below. We have to thank Messrs. E. M. Holmes, J. Hunter, W. G. Travis, W. Watson, and S. Wilson for notes or specimens. Our thanks are also due to Mr. Britten and Dr. Stirton for assistance with the Bibliography.

Baker=John Gilbert Baker, F.R.S.

Borrer=William Borrer (1781–1862). He was associated with Hooker in elucidating the lichens of Scotland. His records appear in Hooker's *Flora Scotica* (1821). His herbarium is at Kew.

Carroll=Isaac Carroll (1828–80). "Contributions to British Lichenology." The species enumerated were discovered by himself or Admiral Jones; the new ones were described by Nylander in *Flora*; the list of localities under the above title was given in J. Bot. 1865, 286; 1866, 22; 1867, 255.

Cromb. = Rev. James Crombie (1830?–1906). This abbreviation indicates his principal work, *British Lichens*: "a monograph of lichens found in Britain." London, 1894. It contains many Perthshire records; the collectors' names are not given, but all have been examined by the author, and probably a large proportion collected by himself. Crombie contributed many notes on Perthshire lichens to various periodicals. The most important, from our point of view, are: "New British Lichens," J. Bot. 1868, 48 and 105; "New British Lichens," *Grevillea*, i. 61, ii. 90, iii. 22, iv. 180, viii. 112, x. 22; "A New British *Xylographa*," *ib.* iii. 128. "Recent Additions to the British Lichen Flora," J. Bot. 1882, 271; 1885, 194.

Cromb. Lichenes = The same author's *Lichenes Britannici*, London, 1870.

Dickie = G. Dickie, M.D. (1812–82), Professor of Botany, Aberdeen.

Dickson = James Dickson (1738–1822), *Fasciculus plantarum cryptogamicarum Britanniæ*, London, 1785–1801. Contains figures and descriptions of many new British, and especially Scottish, species. Many of these were probably from Perthshire, but the only ones specifically referred to the county are, in Fasc. 2. 1790, *Lopadium fuscoluteus* and *Aspicilia gibbosa*, and in Fasc. 3. 1793, *Platysma nivale*.

Gardiner = William Gardiner (1808–52). His Perthshire records appear in the *Phytologist* for 1843 and in Leighton's *Lichen Flora*.

Grev. = *Grevillea*.

Gilchrist = Dr. James Gilchrist (1813–85).

Hamilton = Dr. Francis Hamilton *né* Buchanan (1762–1829).

Holl = Harvey Buchanan Holl (1820–86). His Perthshire records appear in the works of Mudd and Leighton. He did not publish anything himself, but he was an acute observer, and made a collection of twenty-seven volumes of lichens, now in the National Herbarium.

Holmes = Edward Morrell Holmes, F.L.S., of the Pharmaceutical Museum. Records received in correspondence.

Hook. = Sir William Jackson Hooker (1785–1865). *Flora Scotica*, Part 2, 1821.

Hunter = J. Hunter, of Ballasalla, Isle of Man. Records communicated to us.

Jones = Rear-Admiral Theobald Jones (1790–1868). Collected in Perthshire, but did not publish anything. His new discoveries were recorded by Nylander, Carroll, Crombie, &c. His herbarium is at Trinity College, Dublin.

J. Bot. = *Journal of Botany*.

Leighton = Rev. William Allport Leighton (1805–89). *The Lichen Flora of Great Britain, Ireland, and the Channel Islands*. Shrewsbury, ed. 1, 1871; ed. 3, 1879. Although Leighton does not appear to have collected in Perthshire, the *Flora* contains many Perthshire records, with names of collectors.

Lightf. = Rev. John Lightfoot (1735–88). *Flora Scotica*, London, 1777. Contains some of the earliest references to Perthshire

lichens. The book owed its existence to Thomas Pennant, who invited Lightfoot to join him in his second tour and voyage to the Hebrides in the summer of 1772, and suggested that he should compile a Flora of Scotland. The first edition met with so hostile a reception that it was withdrawn from circulation, to reappear as the "second edition."

Lindsay = Dr. William Lauder Lindsay (1828 or 9–80). *British Lichens*, 1856. Many species referred to as "common" were no doubt observed in Perthshire, as Lindsay's residence near Perth afforded him excellent opportunities of studying the lichens of the district. He corresponded with Mudd.

Maingay = Dr. Alexander Carroll Maingay (1836–69), of Ardglass. A correspondent of Mudd.

Mudd = William Mudd (1830–79). *Manual of British Lichens*, Darlington, 1861. Although Mudd did not collect in Perthshire, his correspondence with others enabled him to place many of the local rarities on record for the first time.

Smith = Miss Annie Lorrain Smith, F.L.S. *British Lichens*, Part ii. 1911. Contains many records not previously published. The collectors' names are not given, but Miss Smith has examined most of those recorded.

Stirton = Dr. James Stirton, F.L.S., of Glasgow. The discoverer of many new Scottish species, and author of the following papers: "Additions to the Lichen Flora of Great Britain," *Grev.* ii. 71. "Two New Lichens from Ben Lawers," *ib.* 106. "Lichens British and Foreign." *Trans. Glasgow Soc. Nat.* 1875, 85. "New and Rare Scottish Lichens." *Scottish Naturalist*, 1880, 1.

Stuart = Rev. John Stuart (1777–1805). For some time minister at Killin. Lightfoot in *Flora Scotica* acknowledges his indebtedness to him for many rare species. They travelled together through the Highlands, and afterwards corresponded.

Travis = William Gladstone Travis, of Walton, Lancashire.

Watson = William Watson, B.Sc., of Taunton, Somerset.

West = William West, F.L.S. (1848-1914), late of Bradford.

Wilson = Sydney Wilson, of Perth.

The four last communicated specimens and notes to the authors.

* = Not previously recorded for Perthshire.

! after locality = Seen there by the authors. Where no authority for a locality is quoted, the authors jointly are responsible.

Botanical Divisions.

Perthshire was divided by H. C. Watson into three botanical divisions or vice-counties, which he termed West, Mid, and East Perth, respectively.

East Perth (vice-county 89) consists of the country to the east of the rivers Garry, Tummel, and Tay, from the boundary of Inverness-shire, near the Boar of Badenoch, down to Perth.

Mid Perth (vice-county 88) contains that portion of the county to the west of the above line, which comes within the drainage area of the Tay and its tributaries.

West Perth (vice-county 87) comprises the southern portion of the county which is drained by the river Forth, together with the county of Clackmannan and the small area in the extreme west of Perthshire, which is drained by the river Falloch. So far as the present paper is concerned, however, we confine ourselves strictly to those records within the county of Perthshire, and do not include any from the county of Clackmannan.

The figures 87, 88, 89 refer to these vice-counties.

Ephebaceæ.

Gonionema velutinum Nyl. On mica-schist rocks amongst the higher hills. **88.** Ben Lawers and Craig Tulloch, *Cromb.* 19. Achmore, near Killin, 1913.

G. compactum Nyl. Moist subalpine rocks. **88.** Ben Lawers, *Cromb.* 19

Spilonema revertens Nyl. Moist schistose rocks. **88.** Ben Lawers and Craig Tulloch, 1863, *Cromb.* ex *Leight.* ed. 2, 11.

S. scoticum Nyl. On mica-schist rocks, dead mosses and *Stereocaulon condensatum.* **88.** Above Lochan-a-Chait, Ben Lawers, 1867, rare, but sparingly fertile, *Cromb.* in J. Bot. 1868, 105. Creag-na-Caillich, *Cromb.* 21. Seen on Ben Lawers as low as 1350 ft.

Euopsis hæmalea Nyl. On mica-schist rocks. **88.** Ben Lawers, 1871, *Stirton* in *Grev.* ii. 71.

E. granatina Nyl. On alpine rocks. **88.** Ben Lawers, *Holl* ex *Leight.* ed. 1, 14. Creag-na-Caillich, *Cromb.* 23.

Pyrenopsis hæmatopsis Fr. fil. Shady mica-schist rocks at high elevations. **88.** Associated with *Euopsis hæmalea* on the summit of Ben Lawers, 1865, *Jones* ex *Carroll* in J. Bot. 1866, 22.

P. fuscatula Nyl. On rocks. **89.** "Very sparingly on a quartzose boulder in a stream on Cairn Gower at 3690 ft.," *Cromb.* in *Grev.* i. 170. Also, apparently this, but sterile, on the summit of Ben-y-Gloe at 3505 ft., 1912.

P. phylliscella Nyl. On quartzose boulders in mountain streams. **89.** Ben-y-Gloe, very local and rare, 1870, *Cromb.* in *Grev.* iii. 190.

P. homœopsis Nyl. Mica-schist rocks at high elevations. **88.** Above Lochan-a-Chait, 1867, *Cromb.* in J. Bot. 1868, 48. Summits of Ben Lawers and Creag-na-Caillich, *Cromb.* 25.

P. furfurea Nyl. In similar localities to the preceding. **88.** Summit of Ben Lawers; near Loch Tay and in Glen Dochart, 1864, *Jones* ex *Carroll* in J. Bot. 1865, 286.

Ephebe pubescens Nyl. Shady mountain rocks, probably frequent, ascending to 2500 ft. or higher on Ben Lawers. **88.** Glen Lochay and Ben Lawers !, *Cromb.* 28. Near Tyndrum, *Watson.* North side of Loch Rannoch. **89.** Glen Tilt.

E. hispidula Nyl. On damp rocks; rare. **88.** Above

Lochan-a-Chait, *Cromb.* in J. Bot. 1885, 195. Craig Tulloch, *Cromb.* 29.

Collemaceæ.

Lichiniza kenmorensis Nyl. Mica-schist boulders; rare. **88.** Shores of Loch Tay at Kenmore, 1869, *Holl* ex *Cromb.* in *Grev.* 10, 22.

Pterygium pannariellum Nyl. Schistose rocks; rare. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 12. Summit of Creag-na-Caillich, *Cromb.* 35.

Schizoma lichinodeum Nyl. On decayed mosses and on the ground on the higher mountains. **88.** Summit of Ben Lawers, 1863, *Jones* ex *Carroll*, J. Bot. 1865, 287. Creag-na-Caillich, *Cromb.* 39. Ben Eachan, at 3000 ft., 1913, *Watson.*

Collema terrulentum Nyl. On trees; rare. **87.** On the bark of an old ash tree, shore of Loch Katrine, 1874, *Cromb.* in J. Bot. 1874, 140.

C. ceraniscum Nyl. On damp shaded rocks amongst small mosses on mountain summits. **88.** Ben Lawers, *Jones* ex *Carroll*, J. Bot. 1865, 287. Creag-na-Caillich, *Cromb.* 42. King's Seat, Killin, at 3000 ft., and Ben Lawers, at 3900 ft., *Watson.*

C. auriculatum Hoffm. On rocks or walls; rare. **88.** Killin, *Cromb.* 43.

C. furvum Ach. Rocks and walls; probably not uncommon. **87.** On a bridge in Glen Falloch, 1911. **88.** Killin!, *Cromb.* 44. Glen Lochay. **89.** Blair Atholl, *Cromb.* 44.

C. flaccidum Ach. Rocks and walls in shady places; frequent. **88.** Killin, *Cromb. Lichenes*, 5. Kenmore, *Holl* ex *Leight.* ed. 1, 25. Rocks in Finlarig Wood, 1911. **89.** Kinnoull Hill, *Lindsay* ex *Mudd*, 42. Craighall, *Cromb.* Pitlochry and Glen Tilt.

C. pulposum Ach. and form *compactum* Nyl. Old walls and on the ground, &c. **88.** Killin, *Cromb.* 45.

C. tenax Ach. and var. *coronatum* Koerb. In similar situations to the preceding. **88.** Killin, *Cromb.* 46. Ben Lawers, at 3800 ft., 1913, *Watson.*

C. crispum Ach. On mossy walls, &c.; rare. **87.** Near Callander. **88.** Killin, *Cromb. Lichenes*, 4. Craig Tulloch, *Cromb.* 48.

C. cheileum Ach. Rocks, walls, and trunks of trees; probably frequent. **87.** Aberfoyle, 1914. Near Callander. **88.** Trunks of trees at Lawers, *Gardiner* in Phytol. i. 475 (1843). Killin, *Cromb.* 50. **89.** Wall in Pass of Killiecrankie.

Form *nudum* Nyl. **88.** Ben Lawers, *Cromb.* 50. Killin, *Cromb.* ex *Leight.* ed. 3, 20. **89.** Dunkeld, 1912.

C. granuliferum Nyl. Calcareous rocks, walls, &c. **88.** Killin and Ben Lawers, *Cromb.* 51. King's Seat, near Killin, at 3000 ft., 1913, *Watson.* **89.** Glen Tilt.

C. melænum Ach. In similar situations to the preceding. **88.** Killin, *Cromb. Lichenes*, 5. Ben Lawers and Craig Tulloch, *Cromb.* 51.

Form *gyrosum* Ach. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 21.

Form *complicatum* Schl. **88.** Killin, *Cromb.* ex *Leight.* ed. 1, 20.

C. cristatum Hoffm. On mossy walls and rocks; rare. **88.** Killin and Craig Tulloch, *Cromb.* 53.

Synechoblastus nigrescens Stiz. On tree-trunks, especially ash and sycamore. Frequent except in the east. **87.** Callander, *Cromb.* 55. On ash near shore of Loch Voil, 1912, fruiting. **88.** Near Kenmore and Killin!, *Holl* ex *Leight.* ed. 1, 25. Loch Tay and Glen Lochay, *Cromb.* 55. Finlarig. Near Crianlarich, on sycamore. North side of Loch Rannoch, 1911. **89.** Glen Tilt.

S. aggregatum (Nyl.). On trees. **87.** On ash near shore of Loch Voil, fruiting. **88.** Trees near Killin and Aberfeldy, *Cromb.* 56. Fruiting by Loch Tay near Fearnan, 1911. The spores in these examples ranged from 56–72 mm. in length. Near Kenmore, sterile.

S. fasciculare (Ach.). Trunks of trees; rare. **87.** Trees by Loch Katrine, *Cromb. Lichenes*, 7. **88.** Kenmore and Den of Aberfeldy, *Holl* ex *Leight.* ed. 1, 23. Near Killin.

S. multipartitum (Sm.). Calcareous rocks. **88.** Ben Lawers, *Dr. Holl* ex *Leight.* ed. 1, 26. Shores of Loch Tay, *Cromb.* 56.

Collemodium plicatile Nyl. var. *hydrocharum* Nyl. Damp calcareous rocks. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 18.

C. fluviatile Nyl. Rocks in the beds of streams, &c., where occasionally submerged. **88.** Ruthven Wood and Loch Earn, *Cromb.* 61. **89.** River Isla, *Cromb.* 61.

C. glebulentum Nyl. Alpine calcareous rocks; rare. **88.** Moist limestone rocks above Lochan-a-Chait, *Cromb.* 61.

C. Schraderi Nyl. Exposed calcareous rocks and walls; rare. **88.** On decayed mortar of old wall, Glen Lyon, *Cromb.* ex *Leight.* ed. 3, 34.

Homodium rhyparodes (Nyl.) (*Collema psorellum* Nyl.). Damp schistose rocks on the higher mountains. **88.** On wet rocks near the summit of Ben Lawers, 1864, *Jones* ex *Carroll* in J. Bot. 1865, 287. Above Lochan-a-Chait, *Cromb.* ex *Leight.* ed. 3, 26, Creag-na-Caillich, *Cromb.* 64.

H. tenuissimum (Koerb.). Amongst mosses and short grass on the ground. **88.** Ben Lawers, *Cromb.* 64. Also in same locality, 1913, *Watson.*

Polychidium muscicola Fr. Amongst mosses on rocks and walls; sometimes on tree trunks. **87.** On trunk of ash near shore of Loch Voil, 1912. **88.** Ben Lawers and Loch Dochart, *Holl* in *Leight.* ed. 1, 28. St. Fillans, *Cromb.* 69.

Leptogium lacerum Gray. Mossy banks, rocks, and walls. **88.** Killin and the Ochills, *Cromb.* 70. Kenmore, 1913. **89.** Den of Balthayock, *Gardiner* ex *Leight.* ed. 3. 28. Glen Tilt.

Form *fimbriatum* Nyl. **88.** Killin, *Cromb.* ex *Leight.* ed. 3, 28.

L. lophæum* Nyl. On old tree trunks. **88. Achmore Woods, near Killin, 1913.

L. pulvinatum Nyl. Exposed mossy calcareous rocks and banks, ascending to 3900 ft. on Ben Lawers. **88.** Killin and Ben Lawers, *Cromb.* 71. Tyndrum, 1913, *Watson.* Glen Lochay. **89.** Glen Tilt.

L. scotinum Fr. Mossy rocks and walls. **88**. Ben Lawers, *Cromb*. 72. **89**. Blair Atholl, *Cromb*. 72. Glen Tilt, 1912.

Var. *sinuatum* Malbr. **88**. Ben Lawers. *Holl* ex *Leight*. ed. 1, 34. Killin, *Cromb*. 72. Bridge near Tyndrum, 1911. Glen Lochay. **89**. Glen Tilt and near Pitlochry, 1912.

Var. *crenatum* Nyl. **88**. Craig Vore and Ben Lawers, *Cromb*. 73.

L. palmatum Mont. On the ground amongst mosses. **89**. Blair Atholl, *Cromb*. ex *Leight*. ed. 3, 31.

L. saturninum Ach. Trunks of old trees, generally ash by streams. **88**. Killin, *D. Turner*. Glen Lyon and Glen Lochay, *Holl* ex *Leight*. ed. 1, 30. Fortingal and Loch Earn, *Cromb*. 76. Finlarig Wood. **89**. Craighall, *Cromb*. 76. Glen Tilt, 1912.

L. Hildenbrandii Nyl. On trees by upland streams. **88**. Glen Ample, *Cromb*. 76. **89**. Craighall, *Cromb*. 76.

L. Burgessii Mont. Trunks of old trees near rivers and lochs. **87**. Glen Falloch, *Holl* ex *Leight*. ed. 1, 31. The Trossachs, *Cromb*. 77. **88**. Glen Lochay, *Cromb*. 77.

Dendriscocaulon bolacinum Nyl. This plant is supposed to be identical with the glomeruli found on the thallus of *Ricasolia amplissima* (which see for localities). As an independent plant it occurs amongst mosses on old trees and on rocks. **88**. Near Taymouth, *Cromb*. 77.

Collemopsis Schæreri Nyl. Calcareous rocks and walls. **88**. Craig Tulloch, *Cromb*. 1870.

C. lecanopsoides Nyl. Calcareous rocks; rare. **88**. Craig Tulloch, *Cromb*. ex *Leight*. ed. 3, 35.

C. furfurella Nyl. Moist schistose rocks on mountains; rare. **88**. Meall Ghaordie, *Cromb*. ex *Leight*. ed. 1, 18. Summit of Corbuie in Breadalbane, 1865, *Jones* ex *Leight*. ed. 3. 36. Above Lochan-a-Chait, *Cromb*. 79.

Stictaceæ.

Stictina intricata Nyl. var. *Thouarsii* Nyl. Mossy rocks and tree trunks. **88**. Ben Lawers, *Cromb*. ex *Leight*. ed. 1, 114. Loch Tay, *Cromb*. 266. Rocks in wood near Killin (south side of Loch Tay), 1912, *Hunter*. Finlarig, 1898.

S. crocata Nyl. Mossy trees and rocks in damp shady places. **87**. Glen Falloch, *Holl* ex *Leight*. ed. 1, 115. **88**. "Falls of Moness, Aberfeldy, and various parts of the Highlands of Perth," *Lindsay*, 187. Ben Lawers, *Dr. Holl* ex *Leight*. ed. 1, 115. Ravine at foot of Ben More, *Cromb. Lichenes*, 31.

S. fuliginosa Nyl. On mossy tree trunks and rocks in damp shady situations amongst the mountains. Frequent in the west of the county. **87**. Falls of Leny, *Cromb*. 268. The Trossachs and Loch Katrine. On trees, and on rocks on north shore of Loch Voil, under trees, very fine and abundant, 1912. **88**. Woods in Glen Lochay !, *Phytol*. 1843. Near entrance of Glen Lyon, *Macmillan* ex *Mudd*, 88. Killin. North side of Loch Rannoch. Loch Earn. **89**. Glen Tilt, 1912.

S. limbata Nyl. In similar situations to the preceding.

87. Loch Katrine! and Pass of Leny, *Cromb.* 268. Glen Falloch, *West.* The Trossachs; near Loch Ard; and Loch Achray, 1914. Loch Voil. **88.** Frequent on trees amongst the mountains. **89.** Glen Tilt.

S. sylvatica Nyl. Damp mossy rocks and roots of trees by lakes and rivers. **87.** Falls of Leny, *Cromb.* 269. Near Loch Voil, 1912. **88.** Birks of Aberfeldy, *Macmillan* ex *Mudd*, 87. Killin, *Holl* ex *Leight.* ed. 1, 116. Glen Lochay!, *Cromb.* Falls of Moness, *Lady Wilson.* Finlarig Woods.

Lobarina scrobiculata Nyl. On trunks of trees, and sometimes on shady rocks, in wooded mountain districts. Frequent in the west, but fruit rare. **87.** Loch Katrine, *Cromb. Lichenes*, 30. Pass of Leny and Loch Conn, *Cromb.* 271. The Trossachs, and sparingly near Loch Voil, 1912. **88.** Glen Lochay, *Phytol.* 1843. Finlarig!, *Cromb.* Shores of Loch Earn, Loch Tay, and Loch Rannoch, and many other localities in this vice-county.

Lobaria pulmonaria Hoffm. In similar situations to the preceding, and, like it, commonest in the west and central parts of the county. Fruiting freely at Killin and in Glen Lyon, and, more sparingly, at the Trossachs. **87.** The Trossachs and Loch Katrine!, *Cromb.* 272. Sparingly near Loch Voil. **88.** Finlarig!, *Phytol.* 1843. Sparingly on ash near Crianlarich. Woods on north side of Loch Rannoch; very fine. Very abundant on trees, more sparingly on rocks, two miles above Fortingal, Glen Lyon. South side of Loch Earn. **89.** On willow in Glen Tilt, sparingly.

Var. *pleurocarpa* Ach. **87.** The Trossachs, *Cromb.* 272.

*Form *papillaris* Del. **88.** Finlarig, Killin, 1913.

Form *hypomela* Cromb. **88.** Glen Lochay, *Cromb.* 272.

*Var. *angustiloba*, var. nov. Thallus small, thin and papery in texture, deeply divided into many laciniæ. Pale beneath except in the centre. **87.** Trees near Loch Achray, 1912, *A. Wilson.*

Ricasolia amplissima Leight. On the trunks of old trees, especially oak, locally plentiful, but not common generally, and not yet seen in the east of the county. **87.** Loch Katrine, *Cromb.* 275. **88.** Breadalbane district and Craigie Hill, near Perth, *Lindsay*, 189. Moncreiffe Hill, Perth, *Lindsay*; and near Aberfeldy, *Macmillan* ex *Mudd*, 91. Glen Lochay! and Kenmore, *Cromb.* 275. Glen Lyon, Fearnan, and Finlarig. Loch Earn. Abundant in Achmore Woods, near Killin.

R. lætevirens Leight. In similar situations to the preceding; rare. **87.** The Trossachs and Bracklin Falls, *Cromb.* 276. Seen sparingly on rocks at the former station in 1914. **88.** Strath Bran Woods, *Baker* ex *Mudd*, 91. Glen Lochay, *Cromb.* 276. **89.** Craighall, near Blairgowrie, *Cromb.* 276.

Peltigeraceæ.

Peltidea aphthosa Ach. Damp mossy rocks in shady situations. Rather frequent, but fruiting rarely. **87.** Near the shore of Loch Voil, 1912. **88.** Ben Lawers! *Phytol.* 1843. Glen Lochay!

Killin ! and Den of Rechip, *Cromb.* 278. Achmore; Glen Lyon; and by the River Tummel. Ben Chalum, at 3200 ft. Fruiting near the Falls of Lochay, 1913. **89**. Banks of the Garry, Blair Atholl, well fruited, *Cromb.* in *Grev.* i. 170.

Var. *leucophlebia* Not. **87.** The Trossachs, *Cromb.* 279. **88.** The Ochills and Rannoch, *Cromb. ib.*

P. venosa Ach. On earth amongst rocks and sometimes on walls. **88.** Foot of Ben Lawers and Birks of Aberfeldy, *Macmillan.* Pass of Killiecrankie, *Rev. J. Dalton*, and Killin !, *Lindsay* ex *Mudd*, 85. Allt Dubh Ghalair, Meall-na-Saone, at 2350 ft. **89.** Blair Atholl, *Borrer & Hooker* in Hook. 60. Foot of Glen Fender, 1908.

Solorina crocea Ach. Stony and gravelly earth, or spreading over mosses, on the higher mountains, ascending to the cairn on Ben Lawers, 3990 ft. **88.** "We are indebted to Mr. Stuart for the discovery of this rare lichen, who found it upon a rock near the top of Benteskerney, in Breadalbane," *Lightfoot*, 856. On all the Breadalbane Mountains at 3000 ft. as Ben More, Ben Chalum !, Creag-na-Caillich, *McKinley* ex *Leight.* ed. 1, 112. Meall Ghaordie, *Leight.* ed. 3, 106. Ben Lawers !, *Cromb. Lichenes*, 29. **89.** Craig Gowar, *McKinley* ex *Leight.* ed. 3, 106. Ben Vrackie, 1896, *Holmes.* We saw it there in 1912, at 2700 ft.

S. saccata Ach. On calcareous rocks and earth. Not common. **88.** Den of Lawers, below the falls, *Phytol.* 1843. Killin, *Dr. Holl.* Craig Tulloch and Finlarig, *Cromb.* ex *Leight.* ed. 1, 113. Ben Lawers, 1913.

S. spongiosa Nyl. In similar situations to the preceding. **88.** Killin, *Cromb. Lichenes*, 30. Ben Lawers, *Dr. Holl*; Finlarig; near Tummel Bridge and Craig Tulloch, *Cromb.* 282.

S. bispora Nyl. Calcareous earth amongst rocks. Only seen on the mountains, ascending on Ben Lawers to 3900 ft. **88.** Ben Lawers !, *Stirt.* in *Grev.* ii. 60. "Since detecting this for the first time on Ben Lawers I have secured it on almost every mountain in Scotland that I have climbed of a greater elevation than 3000 ft., *Stirton, loc. cit.* North side of Ben Laoigh, at 1600 ft., 1911.

Nephromium lævigatum Nyl. On tree trunks and mossy rocks. **88.** Killin, *Holl* ex *Leight.* ed. 1, 105. Glen Lochay, *Cromb.* 284. Trees near Fearnan. Finlarig Wood, near Killin. **89.** Blair Atholl, *Dickie* ex *Leight.* ed. 1, 105.

N. parile Nyl. On mossy rocks and trees; rare. **87.** Near Loch Voil, Nov. 1912. **88.** Glen Lochay, *Cromb.* 284. Achmore, Killin, *Watson.* South side of Loch Earn, 1914. **89.** Pass of Killiecrankie, *Cromb.* 284.

Var. *subtomentellum* Nyl. **88.** Glen Lochay, Killin, *Cromb.* 285.

N. lusitanicum Nyl. Tree trunks. Common in the western and central districts. **87.** Pass of Leny, *Cromb.* 285. The Trossachs, Loch Voil, and near Loch Achray. **88.** Falls of Moness, Aberfeldy, *Holl* ex *Leight.* ed. 1, 106. Glen Lochay,

Cromb. ib. Achmore and Finlarig Wood, near Killin. Drummond Hill. Near Fortingal, Glen Lyon. By the River Tummel, Pitlochry. Shores of Loch Rannoch. **89.** Hazels in Glen Tilt.

Form *panniforme* Cromb. **88.** Glen Lochay, *Cromb.* 286. Near Fortingal, Glen Lyon, 1911.

*Var. *hibernicum* Nyl. ex Leight. **88.** Near Kenmore, 1913.

Peltigera malacea* Fr. On mossy rocks, &c.; rare. **88. Ben Lawers, 1905. Trees near Fearnan.

Var. *microloba* Nyl. **88.** Glen Lochay, *Cromb.* 287.

P. canina Hoffm. Damp mossy banks and rocks. Frequent in all three vice-counties, ascending to 3400 ft. on Stob Coire-an-Lochan, and 3700 ft. on Ben Lawers.

Var. *membranacea* Nyl. **87.** Near Loch Achray. **88.** Killin, *Cromb.* 288. **89.** Blair Atholl, *Cromb. ib.* Strelitz Wood, 1914.

Var. *spongiosa* Del. **88.** Rannoch Moor.

P. rufescens Hoffm. Mossy banks and walls. **88.** Rannoch, *Cromb.* 289. King's Seat, Killin, at 2500 ft., and Tyndrum, *Watson.*

Form *prætextata* Floerke. **88.** Glen Lochay, Killin, *Cromb.* 289. South side of Loch Rannoch. Achmore, Killin. **89.** Glen Fender, *Cromb. ib.* Glen Tilt.

Form *sorediata* Oliv. **87.** The Trossachs, 1912.

P. spuria Leight. On the ground amongst short grass. **87.** The Trossachs, *Cromb.* ex *Leight.* ed. 1, 109. **88.** Falls of Tummel, *Cromb.* **89.** Blair Atholl, *Cromb.*

P. polydactyla Hoffm. Grassy and mossy banks. **87.** Callander, *Lindsay*, 169. The Trossachs. **88.** Killin, *Cromb.* ex *Leight.* ed. 1, 109. Glen Lochay, *Cromb.* King's Seat, at 2900 ft., *Watson*, 1913. **89.** Blair Atholl and Glen Fender, *Cromb.* King's Seat, Sidlaw Hills, 1914.

Form *collina* Nyl. **88.** Glen Lochay, *Cromb.* 291.

Form *microcarpa* Nyl. **88.** Killin, *Cromb.* Near Kinloch Rannoch. **89.** Strelitz Wood, near Cargill, and Sidlaw Hills, 1914.

Var. *lophyra* Nyl. **88.** Finlarig, near Killin, *Cromb.* 292.

Var. *hymenina* Nyl. **87.** The Trossachs, 1914. Aberfoyle. **88.** Glen Lochay, *Cromb.* ex *Leight.* ed. 3, 104. Ben Lawers, *Cromb.* 292.

P. scutata Leight. Grassy and mossy banks and on tree trunks. **87.** The Trossachs !, *Cromb.* ex *Leight.* 1, 110. **88.** Breadalbane Highlands, *Lindsay*, 169. Killin !, *Holl* ex *Leight.* ed. 1, 110. Glen Lochay, *Cromb.* Finlarig Woods, Glen Lyon, and Loch Rannoch.

P. horizontalis Hoffm. Shaded rocks and walls and mossy banks. Common and very fine in all three vice-counties.

Form *muscorum* Schl. **88.** Glen Lochay, *Cromb.* ex *Leight.* ed. 3, 105. Trees in Glen Lyon. Near Fearnan, Killin and Loch Earn. **89.** Glen Tilt.

Pannariaceæ.

Pannaria rubiginosa Del. On the trunks of trees, locally common in wooded mountain districts. **87**. Glen Falloch, *Cromb.* 337. **88**. Aberfeldy, *Maingay* ex *Mudd.* 122. Killin !, *Holl* ex *Leight.* ed. 1, 164. Glen Lochay !, *Cromb.* Glen Lyon and Kinloch Rannoch. Very fine on ash, south side of Loch Earn, 1914.

Var. *cæruleo-badia* Mudd. On mossy tree trunks. **87**. The Trossachs, *Cromb.* ex *Leight.* ed. 1, 165. Trees near Loch Voil and Loch Achray. **88**. Den of Rechip; Aberfeldy; Killin !, *Cromb.* 337. Near Fortingal, Glen Lyon; Kinloch Rannoch; Glen Lochay and Finlarig Woods; Loch Earn, 1914.

P. brunnea Nyl. Damp mossy rocks by rivers, &c. **88**. "On wet micaceous rocks of Mael Greadha and Ben Lawers," *Borrer & Hooker* ex *Hook.* 51. Kenmore, *Holl* ex *Leight.* ed. 1, 166. Den of Rechip, *Cromb.* Meall nan Tarmachan, *Travis.* Ben Lawers, at 3800 ft., *Watson.* Falls of Tummel, 1912 (a very dark form, with blackish hypothallus). Falls of Lochay.

P. nebulosa Nyl. In similar situations to the preceding. **87**. Near Stirling, *Buchanan* ex *Leight.* ed. 1, 166. Shore of Loch Voil. **88**. Killin and Loch Tay, *Cromb. Lichenes*, 42. Tyndrum, *Watson.*

P. Hookeri Nyl. Mica-schist rocks in alpine situations. **88**. "On wet micaceous rocks of Mael Greadha and Ben Lawers," *Borrer & Hooker* ex *Hook.* 51. Creag-na-Caillich, *Cromb.* 339. We have seen it on Ben Lawers, at 3800 ft.

Var. *leucolepis* Nyl. **88**. Ben Lawers, *Cromb. Lichenes*, 42.

Pannularia lepidiota Nyl. Mossy alpine rocks; rare. **88**. Above Lochan-a-Chait, Ben Lawers, *Cromb.* 340.

P. triptophylla Nyl. On the trunks of old trees. **87**. Loch Katrine, *Turner & Hooker* ex *Hook.* 422. Loch Voil, 1912. **88**. Crianlarich and Glen Lochay !, *Cromb.* 342. Kinloch Rannoch; south side of Loch Earn, 1914.

Form *nigricans*. **88**. Achmore and Finlarig, near Killin.

Var. *incrassata* Nyl. **88**. Glen Lochay, *Cromb. ib.*

P. nigra Nyl. On calcareous rocks. **88**. Ben Lawers, *Holl* ex *Leight.* ed. 1, 168. Craig Tulloch, Blair Atholl, *Cromb.* 343.

*Var. *fuscum* Mudd. **88**. Finlarig, 1913.

P. triseptata Nyl. On mica-schist rocks on mountains. **88**. Creag na Caillich, Ben Lawers, and Craig Tulloch, *Cromb.* 344.

P. melantera Cromb. In similar situations to the preceding. **88**. On mica-schist, Ben Lawers, *Cromb.* 344.

P. carnosa Cromb. On mossy rocks amongst the mountains. **88**. Abundant in a ravine at the foot of Ben More, *Cromb. Lichenes*, 43. Ben Lawers, *Cromb.* ex *Leight.* ed. 1, 169. Glen Lochay, *Cromb.* 345.

P. delicatula Nyl. On decayed mosses in alpine situations. **88**. Ben Lawers, *Cromb.* 345.

Coccocarpia plumbea Nyl. On the trunks of trees in wooded mountain districts; locally plentiful. **87**. Glen Falloch, *Holl* ex *Leight.* ed. 1, 170. **88**. Birks of Aberfeldy, *Macmillan* ex *Mudd*,

122. Killin, *Holl, l. c.* Trees near Fortingal and by Loch Tay, Fearnan. Woods on both sides of Loch Rannoch.

Var. *myriocarpa* Nyl. **87**. The Trossachs, *Cromb.* 347. **88**. Aberfeldy and Killin. Drummond Hill, near Fearnan, and Finlarig Wood, 1912.

Leproloma lanuginosa Nyl. On shaded rocks; frequent. **87**. The Trossachs!, *Cromb.* ex *Leight.* ed. 1, 171. Aberfoyle, 1914. **88**. Creag-na-Caillich, *Cromb.* 348. Glen Lyon and Glen Lochay; Ben Lawers, at 2400 ft. **89**. Pass of Killiecrankie.

Caliciaceæ.

Sphinctrina turbinata Fr. Parasitic on species of *Pertusaria*. **89**. Carse of Gowrie, *Bousie* in *Leight.* ed. 1, 38.

[*Cyphelium trichiale* Koerb. **88**. A more or less doubtful and sterile plant was collected by us in Glen Lyon, 1911.]

C. chrysocephalum Koerb. On old pales, &c. **88**. Near Aberfeldy, *Cromb.* 87.

Form *filare* Ach. **88**. On the bark of old firs, Aberfeldy and Ben Lawers, *Cromb.* 88.

C. arenarium Hampe (*Coniocybe citrina* Leight.). On the shaded part of stones in walls and occasionally on rocks, parasitic on the thallus of *Lecidea lucida*. **87**. On cliffs in the ravine at Rumbling Bridge, 1914. **88**. Walls near Loch Tummel, plentiful. Glen Eagles. **89**. Glen Fender, near Blair Atholl, *Cromb.* in *Grev.* i. 170. Pass of Killiecrankie.

C. melanophæum Mass. Decorticated trees, old pales, &c. **87**. Blair Drummond, near Stirling, *Cromb.* ex *Leight.* ed. 1, 42. **88**. Aberfeldy, *Cromb. Lichenes*, 12.

C. elassosporum Horw. On dead decorticated tree trunks; rare. **88**. On alders, Glen Lochay, 1875, *Cromb.* in *Grev.* iv. 180.

Calicium hyperellum Ach. On tree trunks, principally oak. **88**. Aberfeldy, *Cromb.* 91. South side of Loch Rannoch, 1910. **89**. On oaks near the Falls of Fender.

Form *viride* Nyl. **88**. Ben Lawers, *Cromb.* 92. On oaks near the Falls of Tummel, with also f. *sessile* Cromb. Near Kenmore, 1913.

C. curtum Turn. et Borr. On wood and decayed trees. **88**. Killin! and Creag-na-Caillich, *Cromb.* 94. On dead trunks of *Pinus sylvestris*, Black Wood of Rannoch, 1910. **89**. Falls of Bruar, *Cromb.* in *Leight.* ed. 3, 43.

C. trachelinum Ach. On old and decayed trunks of trees. **88**. Ben Lawers and Den of Dupplin, *Cromb.* 94. South side of Loch Rannoch, 1910. Bank of the Tummel near Pitlochry. **89**. Glen Tilt.

Stenocybe byssacea Nyl. On branches of alder in upland glens and by stream sides. Common in all three vice-counties, but often overlooked.

Coniocybe furfuracea Ach. Dead tree roots, decayed mosses, &c. **88**. Aberfeldy, *Cromb. Lichenes*, 14. Achmore, Killin, *Watson*. **89**. Blair Atholl, *Cromb.* ex *Leight.* ed. 3, 45.

Form *fulva* Fr. **88**. Base of Craig Tulloch, 1870, *Cromb.* ex

Leight. ed. 3, 46. Achmore, Killin, *Watson.* **89**. Blair Atholl, *Cromb.* 100.

Sphærophoraceæ.

Sphærophorus compressus Ach. On rocks; frequent. **87**. The Trossachs !, *Cromb.* 104. **88**. Killin, *Cromb. Lichenes*, 15. Meall Chuirn, *Watson.* Ben Lawers and Kinloch Rannoch.

S. coralloides Pers. On rocks and boulders, and occasionally on old trunks of trees; frequent. **87**. The Trossachs !, *Cromb.* 105. Ben Laoigh !, at 3700 ft., *Watson.* Summit of Ben-a-Chroin, 3100 ft. Glen Falloch. Falls of Bracklinn, near Callander, 1912. **88**. Glen Lochay, &c., and in fruit on the summit of Ben Lawers, *Gardiner* in Phytol. 1843. Ben Chalum. **89**. Falls of Bruar, *Cromb.* Ben Vrackie, at 2700 ft.

Form *congestus* Lamy. On exposed boulders. **87**. The Trossachs and Glen Falloch. **88**. Ben Lawers, *Gardiner* in Phytol. 1843. Cam Creag, *Watson.* Ben Laoigh, at 3800 ft., 1911.

S. fragilis Ach. In similar situations to the preceding. Common in all three vice-counties. Observed at 2700 ft. on Ben Vrackie, and at 3400 ft. on Stob Coire-an-Lochan.

Ramalinaceæ.

Ramalina calicaris Nyl. On trees; not common. **88**. Killin ! Kenmore; and Abernethy, *Cromb.* 188. On birch trees in Glen Lyon, and near Loch Rannoch and Loch Laidon, 1911. **89**. Pitlochry and Glen Tilt. On *Populus canescens* near Loch of Butterston.

Var. *subampliata* Nyl. **87**. On ash trees near Loch Venachar. Aberfoyle, 1914. **88**. Loch Earn, 1914.

Var. *subfastigiata* Nyl. **88**. Achmore, near Killin, 1913. **89**. Near Pitlochry.

R. farinacea Ach. On trunks and branches of trees; common throughout the county. First record, *Gardiner* in Phytol. 1843, "Breadalbane, plentiful."

Var. *phalerata* Ach. **87**. Near Loch Achray, 1912. **88**. Achmore, Killin, *Watson.*

R. fraxinea Ach. On trees, principally ash, oak, and lime. Common in vice-counties **88** and **89**, less so in **87**. This and the next species generally occur in open situations—seldom in woods.

Var. *ampliata* Ach. **88**. Killin, *Watson.* Strath Tummel, 1911. South side of Loch Rannoch. **89**. Blair Atholl, *Cromb.* 191.

R. fastigiata Ach. On trees, less frequent than the preceding. **88**. Breadalbane, plentiful, *Gardiner* in Phytol. 1843. Loch Tay and Blaeberry Hill, *Cromb.* 192. Achmore, Killin, *Watson.* **89**. Kinnoull Hill, *Lindsay* ex *Leight.* ed. i. 95. Blair Atholl, *Cromb.* On oak, Red Gorton, *S. Wilson.* Moulin, Strath Ardle, Lawton, &c., 1914.

Form *minutula* Fr. fil. **88**. Achmore, Killin, *Watson.*

R. subfarinacea Nyl. Rocks and walls; rare. **88.** Craig Tulloch, *Cromb.* in *Leight.* ed. 3, 89. **89.** Kinnoull Hill, *Lindsay* ex *Leight. loc. cit.*

R. cuspidata Nyl. **89.** Kinnoull Hill, *Cromb.* 198.

Usnea florida Ach. On trees; rare. **88.** Stronaclachich Woods, Killin, *Cromb.* ex *Leight.* ed. 3, 75. Finlarig. Right bank of River Tummel near Pitlochry, 1912. **89.** Kinnoull Wood, Perth, *Croall* ex *Leight.* ed. 1, 84.

Var. *hirta* Hoffm. On trees; common in woods in all three vice-counties.

U. dasypoga Nyl. On trees; not very common. **87.** Loch Ard, *Cromb.* 204. **88.** Killin, *Cromb.* ex *Leight.* ed. 1, 84. Ben Lawers, *Cromb. ib.* Finlarig, Killin, and by the River Tummel. **89.** Kinnoull Hill, *Lindsay* ex *Leight. l. c.* Strelitz Wood, near Cargill, on pine. Strath Ardle.

Var. *plicata* Nyl. **88.** Stronaclachich Woods, near Killin, *Cromb.* 205. By the Tummel near Pitlochry. **89.** Kinfauns, *Lindsay* ex *Leight.* ed. 1, 85.

Var. *scabrata* Nyl. **88.** Ben Lawers, *Cromb.* in Journ. Bot. 1882, 27. Stronaclachich Wood, *Cromb.* 205.

U. ceratina Ach. On trees, especially conifers; also on rocks. Of frequent occurrence in each of the three vice-counties.

Var. *scabrata* Ach. As frequent as the type. Seen in numerous localities from Loch Katrine in the west to Strelitz Wood and Strath Ardle in the east. Apothecia seen at Loch Rannoch and near Killin.

U. articulata Hoffm. On trees; rare. **88.** Stronaclachich Woods, *Cromb.* 207.

Alectoria sarmentosa Ach. var. *cincinnata* Nyl. On the ground, creeping over mosses, heath, &c., on mountains. Very rare—modern confirmation desirable. **88.** Ben Lawers, *Cromb.* ex *Leight.* ed. 1, 88. This station is not quoted in his later work, *British Lichens.*

A. nigricans Nyl. Among moss on the ground, especially *Rhacomitrium lanuginosum*, in alpine places. Locally plentiful. **88.** Ben Lawers, *Jones & Carroll* in Journ. Bot. 1865, 287. Meall Ghaordi, *Cromb.* **89.** Ben-y-Gloe, descending to a comparatively low altitude, *Cromb.* in *Grev.* i. 170. Cairn Gowar, *Cromb.* 211. Ben-y-Gloe, at 3000–3500 ft., and Ben Vrackie, at 2700 ft., 1912.

A. jubata Nyl. On trees, especially pine, larch, and birch; also on palings. Common in each of the three vice-counties.

Var. *lanestris* Ach. **88.** Killin, *Cromb.* 212.

A. chalybeiformis Nyl. On rocks and boulders; sometimes on trees. **88.** Breadalbane, *Gardiner* in Phytol. 1843. Birnam Hill, *Lindsay* ex *Leight.* ed. 1, 89. Ben More and Ben Lawers, *Cromb.* 213. Finlarig, *Watson.* North side of Loch Rannoch, 1910. Ben Chalum. **89.** Glen Shee, *West.*

A. subcana Nyl. On old fir branches; rare. **87.** North side of Loch Voil, 1912. **88.** Ben Lawers, *Cromb.* ex *Leight.* ed. 3, 80.

A. implexa Nyl. Trunks of old firs; rare. **88.** Killin, *Cromb.*

ex *Leight.* ed. 3, 79. Near Kenmore, 1913. Strath Tummel. Achmore Woods.

A. bicolor Nyl. Exposed rocks and boulders. Common on or amongst the mountains. **87.** The Trossachs. **88.** Common on mossy boulders. **89.** Ben-y-Gloe, 1795, *Dickson* in Hook. 69. Ben Vrackie. Wall near Kirkmichael, 1914, at only 750 ft.

Cetraria islandica Ach. On the ground among heath and in stony and mossy places, especially on mountain summits or ridges, occurring up to 3500 ft. or higher. **88.** "On Creg Chaillech, in Breadalbane," *Lightf.* 829. Lochan-a-Chait, *Phytol.* 1843. Meall Gruaidh and Ben Lawers !, *Cromb.* 216. Am Binnein and Ben Laoigh, 1911.

Form *platyna* Fr. **89.** Muirhall, Perth, *Lindsay* ex *Leight.* ed. 1, 96.

C. crispa Nyl. In similar localities to the preceding. Common on the higher mountains in all three vice-counties, ascending to 3900 ft. on Ben Lawers.

C. aculeata Fr. On rocks and earth on mountains and upland heaths. Frequent in each of the three vice-counties, ascending to the cairn on Ben Lawers, 3990 ft.

Form *hispida* Cromb. **88.** "Creg Chaillech," *Lightf.* 883. Ben Lawers; Craig Tulloch and Rannoch Moor! *Cromb.* 218. Ben Chalum.

Platysma nivale Nyl. Dry mountain summits and ridges; very rare. **88.** Ben Lawers, *Dickson*, fasc. 3, 18. **89.** Glen Shee, 1889, *West.*

[*P. sæpincola* Nyl. The records in Leighton's *Lichen Flora* are doubtful, and Crombie does not repeat any of them in *British Lichens.* Further confirmation of its occurrence in Perthshire is required.]

P. ulophyllum Nyl. On tree trunks. Not uncommon, especially amongst the mountains. **87.** Glen Falloch, *Cromb.* 222. **88.** and **89.** Frequnt in these vice-counties.

P. diffusum Nyl. Old tree stumps, palings, &c.; rare. **87.** Inverarnan, *Cromb.* 222. **88.** Crianlarich, *Cromb.* 222.

P. fahlunense Nyl. Rocks and boulders on the mountains. **87.** Ben Laoigh, *Watson.* **88.** "It was found in Breadalbane and communicated by my ingenious friend and fellow traveller Mr. Stuart," *Lightf.* 819. "Summit of Ben Lawers ! and Stuich-an-Lochan, but little in fructification," *Gardiner* in Phytol. 1843. Ben More !, *Cromb. Lichenes*, 27. Ben Laoigh, *Travis.* **89.** Ben Vrackie, at 1400 ft., 1912.

P. commixtum Nyl. Rocks and boulders, chiefly on the mountains. **88.** Ben Lawers, 1864, *Carroll* in Journ. Bot. 1866, 22. Ben More, *Cromb.* ex *Leight.* ed. 1, 102. Hills near Amulree, *Cromb.* 224. **89.** Ben Vrackie, *Holmes.*

Form *tenuisectum* Cromb. **88.** Ben Lawers, *Cromb.* 224.

P. juniperinum Nyl. On the trunks of old pines; very rare. **88.** Ben Lawers, *Cromb.* ex *Leight.* ed. 1, 102.

P. pinastri Nyl. On trunks and palings; very rare. **88.** Ben Lawers, *Cromb.* 225.

P. glaucum Nyl. Rocks, walls, trees, &c. Very common, and recorded from each of the three vice-counties. "Gathered by Mr. Stuart in Breadalbane," *Lightf.* 838 (1777).

Form *fallax* Nyl. **87.** Glen Falloch, *Cromb.* 226. **88.** Killin and Finlarig, *Cromb.* ex *Leight.* ed. 1, 103. On trees near Loch Laidon, 1911. Strath Tummel.

Var. *tenuisectum* Cromb. **88.** Crianlarich and Ben Lawers, *Cromb.* 227. Rannoch Moor.

P. lacunosum Nyl. Rocks and boulders in subalpine situations. **87.** Glen Falloch, *Cromb.* 227. **88.** Ben Lawers, *Cromb.* ex *Leight.* ed. 1, 104. Creag-na-Caillich, *Cromb.* Granite boulders near Rannoch Station, 1911. Boulder above Lochan-a-Chait, at 2400 ft., 1913.

Parmeliaceæ.

Evernia prunastri Ach. On trunks and branches of trees and shrubs. Frequent in all three vice-counties, as also is f. *sorediata* Ach.

Var. *stictocera* Hook. **88.** Fir wood above the Manse at Killin, *Cromb.* in Journ. Bot. 1872, 233. Stronaclachich and Finlarig Woods, *Cromb.* 230.

E. furfuracea Fr. Trees, old pales, and walls; not common. **87.** Glen Falloch, on palings. North shore of Loch Voil. Aberfoyle. **88.** Ben Lawers and Crianlarich, *Holl* ex *Leight.* ed. 1, 90. Killin! *Cromb. Lichenes*, 24. Glen Lochay and Glen Lyon, *Cromb.* 231. Near Perth, *Lindsay*, 144. Near Crianlarich. **89.** Balthayock Woods, *Lindsay*, 144. Palings in Glen Tilt. Strath Ardle, 1914.

Form *nuda* Cromb. **88.** Crianlarich, *Cromb.* 231.

Form *scobicina* Nyl. **88.** Killin, *Cromb.* 231.

Form *ceratea* Nyl. **87.** Glen Falloch, *Cromb.* 231.

Parmelia perlata Ach. On trunks of trees and on rocks. **87.** Loch Katrine, *Cromb.* 233. Pass of Leny, Loch Achray, and Aberfoyle, 1914. **88.** Killin!, *Watson.* Loch Earn. **89.** Kinnoull Hill, *Lindsay* ex *Mudd*, 92.

P. ciliata Nyl. In similar situations to the preceding. **87.** The Trossachs, 1912. **88.** Shores of Loch Tay, *Cromb.* 234. Glen Lochay.

P. cetrarioides Nyl. On trunks of trees; rare. **87.** Loch Katrine, *Cromb.* 235. **88.** Near Fortingal, 1911.

P. lævigata* Ach. On trunks of trees; rare. **87. The Trossachs. Near Loch Achray. Pass of Leny. **88.** South-east side of Loch Earn, 1914. **89.** Blair Atholl.

P. scortea* Ach. On trunks of trees; rare. **88. Very fine on sycamores, Inverhaggernie, near Crianlarich, 1910. Near Fortingal.

P. saxatilis Ach. On trees, walls, rocks, and boulders. Very common in all three vice-counties, and occasionally fruiting. It ascends to the cairn of Ben Lawers, 3990 ft.

Form *furfuracea* Schaer. **87.** The Trossachs, 1912. **88.** Birnam Hill, *Lindsay* ex *Leight.* ed. 1, 137. Ben Lawers, *Cromb.* 242. Tyndrum, *Watson.* Trees in Glen Lyon. Rannoch Moor.

P. sulcata Tayl. On tree trunks, walls, and rocks. Common in all three vice-counties.

Var. *lævis* Nyl. **88**. Ben Lawers, *Cromb.* 243. Near the head of Loch Rannoch.

P. omphalodes Ach. On rocks and boulders. Common in all three vice-counties. Amulree, *Lindsay* ex *Leight.* ed. 1, 139. It fruits very freely on granite boulders on Rannoch Moor. The typical species ascends to 3700 ft. on Ben Lawers.

Form *cæsio-pruinosa* Nyl. **88**. On alpine rocks, summits of Creag-na-Caillich and Ben Lawers, *Cromb.* in Journ. Bot. 1882, 272.

*Form *alpestris* (Lamy). **88**. Ben Chalum, at 3200 ft., 1910. Am Binnein.

Form *panniformis* Ach. **88**. Ben More, Ben Lawers, and Rannoch, *Cromb.* 244. Creag-na-Caillich.

*Form *glomulifera* Cromb. The peculiar glomeruli do not seem to be analogous to those of *Ricasolia*, but consist of a congested mass of isidia of similar texture to the thallus. They occur rather sparingly scattered, and do not affect the thallus, which is identical in appearance (except for the presence of glomeruli) with surrounding plants. They are attached by a small basal point, and readily fall off. They appear to be of the nature of galls, and the form is hardly entitled to a separate name. **88**. Rocks east of Rannoch Station, and on granite boulders near Loch Laidon.

P. caperata Ach. On trees, rocks, and walls. Not uncommon in the south-west of the county, rare or unknown in the east. **87**. Blair Drummond and Aberfoyle!, *Cromb.* 246. On rocks near Loch Voil; Falls of Bracklyn; Loch Ard. **88**. Plentiful on old walls about Ben Lawers, *Phytol.* 1843. Kenmore, *Cromb. l. c.* Killin.

P. conspersa Ach. Rocks and walls. Frequent in the south-west of the county, less so elsewhere. **87**. Frequent in this vice-county. **88**. Blaeberry Hill, *Lindsay* ex *Mudd*, 102. Ben Lawers! and Aberfeldy, *Cromb.* 248. Loch Laidon and Crianlarich. **89**. Kinnoull Hill, *Lindsay*, 202. (Probably, from Lindsay's description, the f. *isidiata* Leight.) Near Killiecrankie and Dunkeld.

Form *isidiata* Leight. **88**. Ben Lawers and Rannoch!, *Cromb.* 248.

Var. *stenophylla* Ach. **88**. Ben Lawers, *Cromb.* 248.

P. Mougeotii Schaer. On rocks; rare. **88**. Rannoch, *Stirton* in Scottish Nat. 1880, 1. **89**. Near Dunkeld, *Holl* ex *Leight.* ed. 1, 136. King's Seat, Sidlaw Hills, 1914.

P. exasperata Nyl. On tree trunks. Frequent in all three vice-counties.

P. exasperatula* Nyl. On tree trunks; apparently rare. **88. On sycamores, Inverhaggernie, near Crianlarich, 1910. South-east side of Loch Earn.

P. subaurifera Nyl. On tree trunks; rare. **87**. Near Loch Voil, 1912. **88**. Glen Lochay, *Cromb.* 252. **89**. Near Loch of Butterston, Dunkeld, 1912.

P. prolixa* Nyl. On rocks; rare. **89. Near Moulin, 1912. King's Seat, Sidlaw Hills, 1914.

P. sorediata Cromb. On rocks; rare. **88**. Craig Tulloch, near Blair Atholl, *Cromb.* 253.

P. fuliginosa Nyl. On rocks and walls; sometimes on trees. Frequent in all three vice-counties.

Var. *lætevirens* Nyl. On trees and palings. Frequent in all three vice-counties.

P. stygia Ach. On siliceous rocks at high altitudes, ascending to 3840 ft. **88**. Ben More!, *Cromb. Lichenes*, 35.

P. alpicola Fr. On rocks, especially preferring quartz, on the higher mountains. **88**. Ben More, *Cromb.* ex *Leight.* ed. 1, 127; abundant there at 3600 ft., 1905. Summit of Meall Chuirn, at 3000 ft. **89**. Cairn Gowar, *Cromb.* 256. Ben-y-Gloe, at 3500 ft.

P. lanata Wallr. Frequent on mountain rocks and boulders in all three vice-counties, occurring up to 3900 ft. or higher. "Ben Lawers and Stuich-an-Lochan, in fruit," *Phytol.* 1843. We found it fruiting well on Ben More, at 3150 ft., in 1905.

Form *minuscula* Nyl. **88**. Ben Laoigh, in fruit, at 3500 ft.

Var. *reticulata* Cromb. **88**. Ben Lawers, *Cromb.* 257. Near the summit, 1914! **89**. Ben-y-Gloe, sparingly and infertile, *Cromb.* in *Grev.* i. 1873, 170. We observed it there at above 3000 ft. in 1912.

P. tristis Nyl. Rocks and boulders on the mountains. Frequent in all three vice-counties, occurring up to 3500 ft. or over on Am Binnein. Fruiting at 3000 ft. on Meall Chuirn and 3200 ft. on Ben Chalum. First record, *Lightfoot*, Fl. Scot. 1777, 885, "Creg-Chaillech."

P. physodes Ach. On trees, shrubs, heather, rocks, and walls. Common throughout the county. Fruit rare. First record, *Lindsay*, Brit. Lich. 1856, 196, "Perth, very common, fruiting on Kinnoull Hill."

Form *labrosa* Ach. Common in all three vice-counties.

Form *tubulosa* Mudd. **88**. Ben Lawers in fruit, *Cromb.* 260. Tyndrum and Killin, *Watson.* Creag-na-Caillich.

Form *platyphylla* Ach. Frequent in all three vice-counties.

P. vittata Nyl. On the ground in alpine situations. **88**. Knock Hill, Crieff, *Lindsay* ex *Mudd*, 96. Rannoch Moor, 1910. **89**. Ben-y-Gloe; Ben Vrackie, at 2700 ft.

P. encausta Ach. On rocks. **88**. Ben More, *Cromb. Lichenes*, 36. Ben Lawers, *Maingay* ex *Mudd*, 97.

Var. *candefacta* Ach. **88**. Ben Lawers, *Jacob* ex *Mudd*, 97.

Parmeliopsis ambigua Nyl. On bark near the roots of fir trees. **88**. Killin, *Cromb.* 263.

P. aleurites* Nyl. In similar positions to the preceding. **88. Roots of trees, Inverhaggernie, Strath Dochart, 1910.

Physciaceæ.

Xanthoria parietina Th. Fr. Walls, roofs of farm buildings, and trunks of trees. Common in the low country, less frequent amongst the mountains and quite rare in some districts. **87**. Balquhidder. **88**. Finlarig!, *Cromb.* 297. Rannoch, Crianlarich, &c. **89**. Common in the lower parts of this vice-county.

*Form *cinerascens* Leight. **88**. Inverhaggernie, Strath Dochart, 1910. **89**. Black Spout, Pitlochry and near Loch of Lows.

X. polycarpa Fisch.-Benz. On tree trunks, chiefly firs. **88**. Finlarig and near Lawers Inn, *Cromb.* 300.

Form *lobulata* Cromb. **88**. Killin, *Cromb. ib.*

X. lychnea Th. Fr. On rocks, walls, and trunks of trees. **88**. Ben Lawers, *Holl* ex *Leight.* ed. 1, 144. Granite boulders on Rannoch Moor and near the head of Loch Rannoch. Bank of River Tummel. Killin. **89**. Ben Vrackie, 1912.

Var. *pygmæa* Nyl. **88**. Killin, *Cromb.* 301.

Physcia ciliaris DC. On trunks of trees. **88**. Finlarig, *Cromb.* 303. **89**. Balthayock, *Lindsay* ex *Leight.* ed. 1, 145.

Var. *saxicola* Nyl. On rocks. **88**. Craig Tulloch, near Blair Atholl, *Cromb.* 303.

Form *verrucosa* Leight. **89**. Balthayock, *Lindsay* ex *Leight.* ed. 1, 145.

P. speciosa Nyl. On mossy rocks and trees. **87**. Glen Falloch, *Holl* ex *Leight.* ed. 1, 150.

P. pulverulenta Nyl. On the trunks of trees, especially ash, in open situations. Frequent in all three vice-counties.

Form *panniformis* Cromb. **88**. Craig Tulloch, *Cromb.* 306. Aberfeldy, *Watson.* Glen Lyon. Mossy trunks on the south side of Loch Rannoch.

Form *argyphæa* Nyl. **88**. Craig Tulloch, *Cromb.* 307. Finlarig, 1913. **89**. Cargill.

*Var. *angustata* Nyl. **88**. Strath Tummel, 1911.

Var. *subvenusta* Nyl. **88**. Finlarig, *Cromb.* 307. Strath Tummel. **89**. Near the foot of Glen Tilt. Abernyte, 1914.

P. venusta Nyl. Trunks of trees, often growing with the preceding. **87**. Near Loch Achray, 1914. **88**. Loch Tay, Kenmore, *Cromb.* 308. Sycamores at Inverhaggernie, Crianlarich.

P. pityrea Nyl. On tree trunks. **87**. Blair Drummond, near Stirling. Near Loch Voil. Aberfoyle, 1914. **88**. Glen Ample, *Cromb.* 309. **89**. Strelitz Wood, near Cargill.

P. muscigena Nyl. On mossy earth ; rare. **88**. Ben Lawers, *Holl* ex *Leight.* ed. 1, 147. Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 136.

P. subdetersa Nyl. On mossy rocks. **88**. Ben Lawers, *Cromb.* 310.

P. aquila Nyl. On siliceous rocks; rare. **88**. Moncreiffe Hill, near Perth, *Lindsay* ex *Mudd*, 111. Aberfeldy, *Macmillan*, *ibid.*

P. stellaris Nyl. On tree trunks. **88**. Finlarig, *Cromb.* 311. On sycamores, Inverhaggernie, near Crianlarich. Trees by Loch Tay, near Fearnan and near Killin. Strath Tummel. **89**. Pitlochry. On *Populus canescens* near Loch of Butterston.

Var. *leptalea* Nyl. **87**. On alders, Loch Ard. **88**. Killin !, *Cromb.* 311. Strath Tummel. Crianlarich in fruit. **89**. Trees between Pitlochry and Black Spout. Sycamores in Glen Tilt. Loch of Lows and Strelitz Wood, near Cargill.

P. tenella Nyl. On tree trunks, walls, and boulders. **88**. Killin

and Ben Lawers, *Cromb.* 312. Tyndrum, *Watson.* Kinloch Rannoch. **89.** Beech trees near Alyth, *S. Wilson.* Blair Atholl and Falls of Fender. Moulin.

Var. *fimbriatula* Stirt. **88.** Ben Lawers, *Stirt.* in Trans. Glasgow Soc. Nat. 1875, 85.

P. aipolia Nyl. Trunks of trees. **88.** Killin and foot of Ben Lawers, *Cromb.* 313. Aberfeldy, *Watson.* Bank of the Tummel. **89.** Near Pitlochry. Strath Ardle. Near Cargill.

*Var. *anthelina* Cromb. **88.** Finlarig Woods, 1905. Foot of Loch Earn. **89.** On lime trees in Glen Tilt.

Var. *cercidia* Nyl. **87.** Blair Drummond, near Stirling, *Cromb.* 314. **88.** Finlarig, *Cromb. ib.*

P. erosa Leight. On trees and rocks; rare. **88.** Ben Lawers, *Cromb.* 316.

P. cæsia Nyl. On calcareous rocks and walls. **87.** Dunblane, *Cromb.* 318. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 152. Killin. **89.** Wall near Moulin, Pitlochry.

P. obscura Nyl. On the trunks of trees; rare. **88.** Finlarig, Killin, *Cromb.* 318. Near Fortingal. Glen Lyon.

P. lithotea Nyl. Damp rocks on the margins of lakes. **88.** Loch Dochart and Kenmore, *Cromb.* 319.

P. ulothrix Nyl. On tree trunks and walls. **88.** Finlarig, *Cromb.*! Inverhaggernie, near Crianlarich. **89.** Glen Fender, Blair Atholl, *Cromb.* ex *Leight.* ed. 1, 149.

Var. *virella* Cromb. **88.** Finlarig !, *Cromb.* 320. Tyndrum, *Watson.* Strath Tummel, 1911. **89.** Glen Fender, *Cromb.*

P. adglutinata* Nyl. In similar situations to the preceding. **89. Trees near Pitlochry, 1912.

LECANORACEÆ.

Psoroma hypnorum Hoffm. Mossy rocks and earth. **88.** Ben Lawers, *Phytol.* 1843. Killin, *Holl.* Creag-na-Caillich, *Cromb.* Tyndrum, *Watson.* **89.** Glen Fender, *Cromb.*

Form *deaurata* Nyl. **88.** Glen Lochay, *Cromb.* 350.

Squamaria saxicola Pol. Rocks and walls. **88.** Ben Lawers, *Cromb.* 352. Bank of the Dochart and Achmore, Killin, 1913. **89.** Rocks by the Tummel near Pitlochry.

Var. *diffracta* Nyl. **88.** Ben Lawers; Monument Hill, Perth; and Abernethy, *Lindsay* ex *Leight.* ed. 1, 174.

Var. *versicolor* Fr. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 159.

S. gelida Sm. On rocks, especially schist and granite. Not uncommon in the mountain districts, ascending to 3500 ft., or higher, on Ben Lawers. **87.** "First discovered by Dr. Francis Hamilton (late Buchanan) in the Glen of Lenay, near Stirling," *Hook.* 50. Glen Falloch. **88.** Frequent in this vice-county. **89.** Rocks by the Tummel, Pitlochry. King's Seat, Sidlaw Hills, 1914.

Placodium murorum* DC. var. *pulvinata* Malbr. On walls. **89. Near Inchture, associated with *Lecanora galactina*, 1914.

P. tegularis Ehrh. On rocks and walls. **87.** The Trossachs,

Cromb. 361. **88**. Craig Tulloch (the var. *obliterascens* Nyl.), *Cromb. ib.* **89**. Dunkeld, 1912.

P. callopismum Naeg. On rocks and walls. **87**. Stirling, *Cromb.* in *Leight.* ed. 3, 162. **89**. "Wall near the village of Blair" (Atholl), *Cromb.* in *Grev.* i. 170.

P. sympageum* Ach. Calcareous rocks and walls. **89. Blair Atholl, *Cromb.* 363. Bridge of Tilt.

P. cirrochroum Hepp. On calcareous rocks; rare. **88**. Craig Tulloch, near Blair Atholl, *Cromb.* 363.

P. chalybæum Naeg. On calcareous rocks. **88**. Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 179.

P. variabile Hepp. On rocks. **88**. Craig-na-Caillich, *Cromb.* ex *Leight.* ed. 1, 180.

Callopisma laciniosum A. L. Sm. On trunks of trees. **87**. Doune Castle, *Cromb.* 368. **88**. Killin, *Cromb.* ex *Leight.* ed. 1, 182. **89**. Blair Atholl, *Cromb.* Bridge of Tilt and Dunkeld, 1912.

C. vitellinum Sydow. On rocks, walls, and trees. Frequent in all three vice-counties.

Var. *aurellum* Ach. **88**. Killin, *Cromb.* ex *Leight.* ed. 1, 181.

C. citrinum Koerb. On the mortar of walls. **87**. Near Doune, *Cromb.* 372. Aberfoyle and Loch Ard, 1914. **88**. Tyndrum, *Watson.* Crianlarich and Killin. **89**. Blair Atholl; Pitlochry; Dunkeld and Inchture.

C. aurantiacum Koerb. On trunks of trees. **88**. Finlarig, *Cromb.* 373. Falls of Tummel, 1912. Glen Lochay.

C. erythrellum Nyl. On rocks and walls. **88**. Stone walls near Killin, *Turn. & Hook.* ex *Hook.* 49. Ben Lawers, *Cromb.* Morenish, 1913. **89**. Kinnoull Hill and Blair Atholl, *Cromb.* 374.

Var. *inalpinum* Nyl. **88**. Glen Lochay! and Ben Lawers, *Cromb.* 374.

Form *rubescens* Nyl. **88**. Ben Lawers, *Cromb. ib.*

C. ferrugineum Mudd. On trees and rocks. **88**. "On beech and other trees near Perth and on stones in walls," *Lindsay*, 244. Finlarig and Kenmore, *Cromb.* 376. South side of Loch Earn, 1914.

Var. *festivum* Nyl. On rocks and stones in walls. **87**. The Trossachs, *Cromb.* 377. Near Loch Voil, 1912. **88**. Glen Lyon; Glen Lochay; and Achmore, Killin. **89**. Above Moulin, at 1350 ft. Dunkeld.

C. cerinum Koerb. On trunks of trees. **87**. Blair Drummond, *Cromb.* 380. **88**. Craig Tulloch, *Cromb.*

Var. *cyanoleprum* Nyl. **88**. Craig Tulloch, *Cromb. ib.*

Var. *stillicidiorum* Nyl. **88**. Ben Lawers, *Holl* ex *Leight.* ed. 1, 221. Craig Tulloch, *Cromb.* 381.

C. hæmatites* Nyl. On the smooth bark of trees. **88. Finlarig, Killin, 1913.

C. pyraceum Sydow. On rocks and walls. **88**. Ben Lawers, *Cromb.* 384. Tyndrum. **89**. Near Pitlochry, 1912.

Var. *pyrithromum* Nyl. **88**. Craig Tulloch, *Cromb. ib.* Killin, 1913. Bank of River Tummel. **89**. Near Moulin, Pitlochry.

Form *picta* Cromb. **88**. Ben Lawers and Creag-na-Caillich, *Cromb. ib.*

C. holocarpum Nyl. On old pales and very rarely on rocks. **88.** Achmore, Killin, *Cromb.* 385.

Leproplaca xantholyta Nyl. On shaded calcareous rocks. **88.** Craig Tulloch, *Cromb.* 366.

Phialopsis rubra Koerb. On the trunks of trees, especially elm, and occasionally overspreading mosses on rocks and walls. **88.** Trees at foot of Ben Lawers, *Mackay* ex *Hook.* 49. Craig Tulloch, *Cromb.* 458. Summit of Ben Lawers, 1912, *Hunter.* Trees near Finlarig amongst *Collema nigrescens.*

Hæmatomma coccinea Koerb. On shaded perpendicular rock faces; frequent. **87**. The Trossachs!, *Cromb.* Pass of Leny, *West.* Loch Ard, 1914. **88**. Falls of Moness, *Lindsay*, 227. Bank of the Tummel, fruiting, 1912, and numerous localities in this vice-county. **89.** Pass of Killiecrankie.

H. ventosa Mass. On exposed siliceous rocks and boulders. **87.** Glen Falloch and on the summit cairn of Ben-a-Chroin, 3101 ft., 1913. **88**. "Red spangled tartareous lichen." "Upon rocks facing north upon the mountains about Breadalbane," *Stuart* ex *Lightf.* 806. Generally distributed in this vice-county in alpine and subalpine localities. **89.** Ben-y-Gloe and Ben Vrackie.

Lecanora irrubata Nyl. On calcareous rocks. **88**. Craig Tulloch, *Cromb.* 387.

L. calva Nyl. On calcareous rocks and mortar of walls. **88**. Craig Tulloch, *Cromb.* 388. **89.** Blair Atholl.

L. Siebenhaariana Nyl. On moist mica-schist rocks in alpine situations. **88.** Summits of Ben Lawers and Creag-na-Caillich, *Cromb.* in J. Bot. 1885, 195.

L. nivalis Koerb. (*L. fuscoluteolina* Mudd). On decayed mosses upon rocks in alpine situations. **88.** On *Andreæa alpina* on Ben Lawers, *Jones* ex *Mudd*, 153.

L. circinata* Ach. On rocks and walls. **89. Blair Atholl, 1912.

L. galactina Ach. On rocks and walls. **88.** Ben Lawers and Craig Tulloch, *Cromb.* 405. Killin. **89.** Walls near Pitlochry and Inchture, 1914.

L. subluta Nyl. On calcareous walls. **88.** Ben Lawers, *Cromb.* 407.

L. subfusca* Nyl. On trunks of trees. **87. Loch Voil; Glen Falloch; Aberfoyle, 1914. **88**. Near the Falls of Tummel. Achmore and Finlarig, near Killin. **89.** Black Spout, near Pitlochry.

Forma *muscicola* nobis. Thallus thin, grey (K. deep yellow Ca ClO—). Apothecia moderate, concave or plane, shining, deep reddish or blackish brown, thalline margin entire. Spores 12–14 × 7–8 μ. Creeping over mosses (*Tortula* and *Grimmia*) on walls near Pitlochry. This form is probably a state due to the peculiar habitat, which is similar to that of *L. epibryon* Ach. It differs from that, which is a more alpine plant, in having a more dusky thallus, apothecia about half the diameter, and shorter spores.

Form *minor* Oliv. **89.** On *Myrica Gale* near Loch of Lows, 1912. On timber, Dunkeld.

Var. *campestris* Nyl. On walls and stones. **88.** Glen Lyon, *Cromb.* 410. Killin. **89.** Glen Fender, *Cromb. ib.* Dunkeld and Pitlochry, 1912.

L. spodophæoides Nyl. On mica-schist walls. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 188. Bank of River Dochart, Killin, 1913.

L. allophana Nyl. On trunks of trees. **87.** Aberfoyle, 1914. Near Loch Achray. **88.** Frequent in this vice-county. **89.** Balthayock Woods, *Lindsay* ex *Leight.* ed. 1, 200. Near Pitlochry and Dunkeld.

L. epibryon Ach. On decayed mosses on the ground. **88.** Ben Lawers, *Cromb.* 412.

L. rugosa Nyl. On trunks of trees. **87.** Blair Drummond, near Stirling, *Cromb.* 413. The Trossachs. **88.** Killin, *Cromb.* Aberfeldy, *Watson.* Falls of Lochay and Achmore, Killin. **89.** Balthayock Woods, *Lindsay* ex *Leight.* ed. 1, 201. Pitlochry and Abernyte, 1914.

L. chlarona Nyl. On trunks of trees. **87.** The Trossachs and Aberfoyle. On alders near Loch Ard, and on willow, Glen Devon, 1914. **88.** Finlarig !, *Cromb.* 413. Many localities in this vice-county.

Form *pinastri* Cromb. **87.** The Trossachs. **88.** Achmore, Killin ; Blaeberry Hill, Perth, *Cromb.* 414. Falls of Tummel.

Form *geographica* Nyl. **88.** Finlarig !, *Cromb. ib.* Glen Lochay, 1913.

L. atrynea Nyl. On rocks. **88.** Killin, *Cromb.* 414.

Var. *melacarpa* Nyl. **87.** The Trossachs, 1914. **88.** "High up on Craig Tulloch," *Cromb.* ex *Leight.* ed. 3, 87. The apothecia are brownish to quite black. Although many are affected by the fungus *Sphæria epicymatia*, the blackening does not appear to be entirely due to that cause, as young apothecia are quite black frequently, which show no trace of fungal hyphæ.

L. coilocarpa Nyl. On rocks and walls. **87.** The Trossachs, *Cromb.* **88.** Blaeberry Hill, near Perth, *Lindsay* ex *Leight.* ed. 1, 202. Shore of Loch Tay near Fearnan, 1911.

Form *pulicaris* Nyl. **89.** Blair Atholl, *Cromb.* 416.

L. gangaleoides Nyl. On rocks. **88.** Craig Tulloch, *Cromb.* 416.

L. schistina Nyl. On schistose rocks. **88.** Craig Tulloch, *Cromb.* 417.

L. intumescens Koerb. On the smooth bark of trees. **87.** The Trossachs and Aberfoyle, 1914. **88.** Finlarig ! and Creag-na-Caillich, *Cromb.* 417. Achmore !, *Watson.* Glen Lochay. On alders near the shore of Loch Rannoch. **89.** Near Dunkeld.

**L. albella* Ach. In similar situations to the preceding. Frequent in all three vice-counties, on birch, willow, &c.

L. angulosa Ach. On trunks of trees. **87.** Glen Falloch. **88.** Finlarig, *Cromb.* 419. Foot of Ben More. **89.** Near Pitlochry.

L. glaucoma Ach. On siliceous rocks. **88.** Killin !, *Cromb.* 421.

L. subcarnea Ach. On rocks. **88.** Craig Tulloch, *Cromb.* 423. **89.** Glen Tilt, 1912.

L. umbrina Nyl. On rocks, old pales, &c. **89.** Blair Atholl, *Cromb.* 424.

L. crenulata Nyl. On calcareous rocks. **88.** Craig Tulloch, *Cromb.* 425. **89.** Wall near Dunkeld, 1912.

L. Hageni Ach. On trees, old palings, &c. **87.** On decorticated willow, Glen Devon, 1914. Near Loch Voil. **88.** Achmore, Killin, *Cromb.* 425. Finlarig. **89.** Near Alyth, *S. Wilson.* Near Moulin, Pitlochry.

L. mamillifera Stirt. On rocks. **89.** Ben-y-Gloe, *Stirt.* in Trans. Glasgow Soc. Nat. 1875, 85.

L. sulphurea Ach. On rocks. **87.** Glen Falloch. **88.** Ben Lawers, *Cromb.* 429. Ben Laoigh, at 2000 ft. Near Crianlarich. **89.** Near Pitlochry.

L. orosthea Ach. On schistose rocks. **88.** Creag-na-Caillich, *Cromb.* 429.

L. epanora Ach. On rocks and stones in walls. **89.** Glen Fender, *Cromb.* in *Grev.* i. 170. Glen Tilt.

L. varia Ach. On old palings and trees. Common in all three vice-counties.

Form *pleorytis* Ach. **88.** On old pales, Lawers, *Cromb.* 413.

L. conizæa* Nyl. On trees. **88. On larch, Achmore, near Killin, 1913.

L. conizæoides* Nyl. On trees. **88. Near Loch Laidon, fruiting, 1911. **89.** Near Blair Atholl.

L. expallens Ach. var. *lutescens* Nyl. On trunks of trees. **87.** Aberfoyle, 1914. **88.** Creag-na-Caillich and near Loch Tummel, *Cromb.* 433. Glen Eagles and on the south-east side of Loch Earn.

L. symmicta Ach. var. *sæpincola* Nyl. On old palings. **88.** Killin, *Cromb.* 434. Achmore and near Aberfeldy.

L. symmictera Nyl. On trunks of trees and old palings. **88.** Finlarig and Ben Lawers, *Cromb.* 434. **89.** On decorticated trunks near Loch of Lows, Dunkeld. Pitlochry, 1912.

Var. *aitema* Nyl. **88.** Finlarig, Glen Lyon, and Kenmore, *Cromb.* 435. **89.** Glen Fender.

L. piniperda Koerb. On decaying larch-rails and trunks of conifers. **88.** Loch Tummel, *Cromb.* ex *Leight.* ed. 3, 174. **89.** Rare on old larch-poles in Glen Fender, *Cromb.* in *Grev.* 1873, 170.

L. metaboloides Nyl. On old palings, dead stumps of trees, &c. **88.** Abundant about Killin and very variable, *Cromb.* in J. Bot. 1882, 274. Near Crianlarich. **89.** Glen Fender, *Cromb.* Glen Tilt.

L. polytropa Schaer. On rocks. Frequent in all three vice-counties, ascending to the cairn on Ben Lawers (3990 ft.). "Mountains of Breadalbane," 1782, *Stuart* in *Leight.* 197.

Form *efflorescens* Cromb. **88.** Craig Tulloch, *Cromb.* 438.

Form *alpigena* Schaer. **88.** Ben Lawers !, *Cromb.* ex *Leight.*

ed. 3, 181. Seen there at 3000 ft. The large old lobulate apothecia sometimes reach 3 mm. in diameter.

Form *subglobosa* Cromb. **88.** Ben Lawers and Craig Tulloch, *Cromb.* 439.

*Form *acristacea* Schaer. **88.** Rocks by the River Tummel, 1912. Ben More. **89.** King's Seat, Sidlaw Hills.

*Var. *illusoria* Ach. **88.** Shore of Loch Tummel, 1912. Lochan-a-Chait.

L. intricata Nyl. On rocks and walls, ascending to 3150 ft., or higher, on Ben Lawers. **87.** Glen Falloch, at 1100 ft. **88.** Crianlarich; Killin; Ben Lawers!; Craig Tulloch, *Cromb.* 439. Above Lochan-a-Chait. **89.** Moorland east of Dunkeld. Ben-y-Gloe, 1912. Glen Tilt.

Var. *leptacina* Nyl. On mossy boulders at high elevations. **88.** Summit of Ben Lawers, *Cromb. Lichenes*, 52.

L. stenotropa Nyl. On schistose rocks. **88.** Associated with *Lecidea leucophæa* Flk. on a wall on Craig Tulloch, *Cromb.* in *Grev.* 8, 69.

L. subintricata Nyl. On old palings. **88.** Killin, *Cromb.* ex *Leight.* ed. 3, 177. **89.** Glen Fender, *Cromb.*

L. sarcopis Ach. On old palings. **88.** Glen Lyon, *Cromb.* 441.

L. effusa Ach. On old palings. **87.** Loch Katrine, *Cromb.* 441. **88.** Killin, *Cromb.*

L. argopholis Ach. On mountain rocks. **88.** Ben Lawers, *Cromb. Lichenes*, 52. Creag-na-Caillich, *Cromb.* 442. Ben Chalum.

L. frustulosa Ach. On alpine rocks of mica-schist. **88.** Summit of Ben Lawers, *Borrer & Hooker* ex *Hook.* 48. Summit of Creag-na-Caillich and above Lochan-a-Chait, *Cromb.* 442. Ben Cruichben, near Killin, at 3000 ft., 1905.

L. Sambuci Nyl. On trees. **87.** Near Loch Voil. **88.** Creag-na-Caillich, *Cromb.* 443. Glen Dochart, near Killin.

L. dimera* Nyl. On trees; rare. **88. On sycamore, Finlarig, 1913.

L. rhypariza Nyl. form *curvescens* Nyl. Creeping over mosses in alpine situations. **88.** On *Andreæa alpina*, summit of Ben Lawers, *Jones* ex *Mudd*, 125 (as *Pannaria curvescens* Mudd).

L. atra Ach. Rocks and walls; more rarely on trees. Frequent in all three vice-counties. It occurs on Ben Laoigh, at 3550 ft., and on Am Binnein, at 3820 ft. The var. *subbyssoidea* Stirt. (Trans. Glasgow Soc. Nat. 1875, 85) was described from examples collected at Blair Atholl. Crombie considered it to be probably a form of *L. gangaleoides*, but he had seen no specimen.

L. badia Ach. Rocks and walls; not uncommon. **87.** Glen Devon, 1914. **88.** Frequent in this vice-county. **89.** Ben-y-Gloe.

Var. *cinerascens* Nyl. **88.** Craig Tulloch, *Cromb.* 452. **89.** Ben-y-Gloe.

L. picea Nyl. On quartzose alpine rocks. **88.** Ben Lawers, *Holl* ex *Cromb. Lichenes*, 54.

L. tartarea Ach. On rocks and tree trunks, and sometimes on heather stems and mosses. Common in all three vice-counties, and fruiting freely. "On large micaceous boulders, at a slight

elevation above the sea round Perth. Abundant on the mountains," *Lindsay*, 217.

Var. *frigida* Ach. **87**. Summit of Ben-a-Chroin (3101 ft.). **88**. Ben Lawers !, *Lindsay* ex *Mudd*, 156. **89**. "Hills above Blair in Athole," *Don* ex *Leight*. ed. 1, 188. Ben Vrackie, at 2700 ft., and Ben-y-Gloe, at 3500 ft., 1912. When fruiting well the thalline margin is sometimes spinulose, and the apothecia are occasionally proliferous.

*Form *microcarpa* Fr. fil. **88**. Creeping over mosses on Rannoch Moor.

L. subtartarea Nyl. On trees and rocks. **87**. Ben Laoigh, at 3700 ft., *Watson*. **88**. Creag-na-Caillich and Craig Tulloch, *Cromb*. 460. Near Kinloch Rannoch and Killin. **89**. Ben Vrackie, *Cromb. ib*.

L. parella Ach. Rocks, walls, and trunks of trees. Common in all three vice-counties.

Var. *Turneri* Nyl. **89**. Moulin, near Pitlochry, 1912.

L. pallescens Nyl. On trunks of trees. **88**. Aberfeldy, *Holl* ex *Leight*. ed. 1, 189.

L. Upsaliensis Nyl. Overspreading mosses on the ground in alpine situations. **88**. Creag-na-Caillich, *Cromb*. 463.

L. geminipara Fr. fil. In similar situations to the preceding. **88**. Ben Lawers, *Cromb*. in J. Bot. 1882, 274.

Rinodina exigua Gray var. *lecideoides* Cromb. On old palings. **88**. Glen Lochay, *Cromb*. 396.

R. sophodes* Massal. On the trunks of trees. **87. Ash trees near Loch Venachar, 1912.

R. atrocinerea Koerb. On rocks. **88**. Lochan-a-Chait, Ben Lawers, *Jones* ex *Mudd*, 144.

R. teichophila Jatta. On rocks and walls. **87**. The Trossachs, *Cromb*. 390.

R. Bischoffii Koerb. On calcareous rocks. **88**. Craig Tulloch, *Cromb*. ex *Leight*. ed. 3, 220. On stones in wall, Glen Lochay, 1913.

R. polyspora Fr. fil. **88**. Creag-na-Caillich, *Cromb*. 402.

Aspicilia superiuscula Nyl. On schistose alpine rocks. **88**. Above Lochan-a-Chait, 1878, *Cromb*. in *Grev*. 8, 112.

A. leucophyma A. L. Sm. In similar situations to the preceding. **88**. Above Lochan-a-Chait, 1864, *Jones & Carroll* in *Leight*. ed. 1, 205. Creag-na-Caillich and summit of Ben Lawers, *Cromb*. 465.

A. oculata Ach. On mosses and schistose rocks in alpine situations. **88**. Ben Lawers, on moss and grass, *Turner & Hooker* ex *Hook*. 47. Creag-na-Caillich, *Cromb*.

A. cinerea Koerb. On rocks and walls. **87**. Glen Falloch. South side of Am Bipnein, at 3500 ft., 1912. **88**. Ben Lawers, *Cromb*. ex *Leight*. ed. 1, 196. Glen Lochay and Killin, *Cromb*. Boulders on shore of Loch Laidon, 1911.

A. epiglypta* Nyl. On schistose rocks. **88. Above Lochan-a-Chait, at 2400 ft., 1913.

A. alpina Sydow. On alpine rocks of mica-schist. **88**. Ben Lawers, *Cromb*. 468.

A. cinereorufescens Koerb. form *diamarta* Nyl. In similar

situations to the preceding. **88.** Breadalbane, *Cromb. Lichenes*, 55. Above Lochan-a-Chait, *Cromb.*

A. pelobotrya Mudd. On alpine rocks of mica-schist. **88.** Head of Lochan-a-Chait, Ben Lawers, *Jones* ex *Mudd*, 164. Creag-na-Caillich, *Cromb.*

A. gibbosa Koerb. On rocks and walls. **88.** Summit of Ben Lawers, *Dickson*, Fascic. 2, 20. **89.** Near Cluny Bridge, Pitlochry, 1912.

Var. *lusca* Nyl. **88.** Ben Lawers and Creag-na-Caillich, *Cromb.* 471.

A. depressa Nyl. On rocks of mica-schist. **88.** Ben Lawers, *Cromb. Lichenes*, 55. Achmore, Killin, 1913.

A. subdepressa Nyl. On schistose rocks. **88.** Creag-na-Caillich and Ben Lawers, *Cromb.* 472. **89.** Near Dunkeld, 1912. Our examples approach *A. depressa* in their dark olive-grey colour, and rather small spores (20 × 14 μ), but the lecanornine apothecia, several in each areola, agree well with the description of this subspecies.

A. cæsiocinerea A. L. Sm. On rocks. **88.** Glen Lyon and Ben Lawers, *Cromb.* 472.

Form *obscurata* Nyl. **88.** Craig Tulloch, *Cromb.* 473.

A. calcarea Somm. On rocks and walls, preferring those that are calcareous. **88.** Head of Lochan-a-Chait !, *Jones* ex *Mudd*, 307. Killin, *Cromb.* ex *Leight.* ed. 3, 192. **89.** Blair Atholl, *Cromb.*

Var. *contorta* Nyl. **88.** Killin, *Cromb.* **89.** Blair Atholl, *Cromb.* Killiecrankie, 1912.

Form *monstrosa* Cromb. **89.** Glen Fender, *Cromb.* 475. Killiecrankie.

Var. *Hoffmanni* Somm. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 209. **89.** Glen Fender, *Cromb.*

A. verrucosa Mudd. Creeping over dead mosses or rocks, or, rarely, on the ground. **88.** Creag-na-Caillich and Ben Lawers, *Maingay* ex *Mudd*, 164. Craig Tulloch, *Cromb.*

A. poriniformis A. L. Sm. On schistose rocks and walls. **88.** Ben Lawers, 1865, *Carroll* in J. Bot. 1866, 23. Craig Tulloch, *Cromb.* Ben Laoigh, at 2500 ft., 1911.

A. Dicksonii A. L. Sm. On rocks and walls. Frequent amongst the mountains in all three vice-counties, ascending to 3900 ft. on Ben Lawers. It is difficult to believe with Crombie that the colour of the thallus of this lichen is due to accidental suffusion with iron peroxide. It occasionally grows on pure white quartz crystals (as on Ben Lawers) mingled with white crusted species, and is very uniform in tint on granites, schists, and sandstones.

A. flavida* Arn. On damp quartzose rocks. **88. South-east side of Loch Earn. Spores, not well developed, 3–15 μ × 7–10 μ.

A. lacustris Fr. fil. On rocks in or by streams where often submerged. **87.** Glen Falloch, *Cromb.* **88.** Lochan-a-Chait, *Holl* ex *Leight.* ed. 1, 210. Ben Lawers, *Cromb.* Glen Lochay, 1913.

A. Prevostii Fr. fil. On limestone rocks. **88.** Craig Tulloch, where also occur form *melanocarpa* Stiz. and var. *affinis* Nyl. *Cromb.* 478.

Ionaspis epulotica Mudd. On calcareous and schistose rocks, especially near streams. **87.** The Trossachs, *Cromb.* ex *Leight.* ed. 1, 212. **88.** Head of Lochan-a-Chait, *Jones* ex *Mudd*, 161. Creag-na-Caillich and Craig Tulloch, *Cromb.* 480.

I. chrysophana Koerb. On rocks and stones in alpine situations. **88.** Above Lcchan-a-Chait, *Cromb.* 480.

Acarospora glaucocarpa Koerb. On calcareous and schistose rocks. **88.** Ben Lawers, *Cromb. Lichenes*, 56. Craig Tulloch, *Cromb.*

Var. *depauperata* Cromb. form *pruinifera*, and form *denudata* Cromb. **88.** Craig Tulloch, *Cromb.* 481.

A. eucarpa Jatta (*Lecanora eucarpa* Nyl.). **88.** On boulders, partly submerged, on the shores of Loch Rannoch, Sept. 1882, *Stirt.* Dr. Stirton described this as a new genus and species in the *Scottish Naturalist* as *Cathisinia concinna.* Miss Lorrain Smith sent an original specimen to Zahlbruchner, who identified it as *L. eucarpa* Nyl. (*Biatorella clavus* Th. Fr.) with which view she concurs.

A. squamulosa Fr. fil. On limestone rocks. **88.** Craig Tulloch, *Cromb.* 482, where it is accompanied by form *albomarginata* Cromb.

A. peliocypha* Nyl. On rocks; rare. **87. Glen Devon, 1914.

A. fuscata Nyl. On rocks. **88.** Ben Lawers, *Cromb. Lichenes*, 56. Creag-na-Caillich, *Cromb.* Glen Lochay. **89.** Ben-y-Gloe, and near Dunkeld, 1912.

A. admissa Nyl. On exposed schistose rocks. **87.** Ben-a-Chroin, at 2500 ft., 1913. **88.** Summit of Ben Lawers, *Cromb.* 485.

A. smaragdula Koerb. (*Endocarpon smaragdulum* Wahl.). On rocks. **88.** Ben Lawers, *Cromb.* 486. Glen Lochay and Glen Lyon, 1911. **89.** Ben-y-Gloe. King's Seat, Sidlaw Hills, 1914.

Form *sinopica* Nyl. (*Endocarpon sinopicum* Wahl.). **88.** Aberfeldy and Ben Lawers !, *Macmillan* ex *Mudd*, 160. Killin, *Cromb.* Glen Lochay. Lochan-a-Chait, at 2400 ft. Ben More. **89.** Ben Vrackie !, *Cromb.*

A. pruinosa Jatta. On calcareous rocks and mortar of walls. **88.** Craig Tulloch, *Cromb.* 488. **89.** Blair Atholl, 1912.

Form *nuda* Nyl. **88.** Ben Lawers and Craig Tulloch, *Cromb. ib.*

A. simplex Jatta (*Sarcogyne simplex* Dav.). On schistose and calcareous rocks. **88.** Creag-na-Caillich, Ben Lawers, and Craig Tulloch, *Cromb.*

Form *strepsodina* Ach. **89.** On stones of mica-schist, Pass of Killiecrankie, 1912.

Pertusariaceæ.

Pertusaria dactylina Nyl. On bare ground and overspreading mosses in alpine situations. **88.** Ben Lawers, *Cromb.* 493.

P. globulifera Nyl. On trunks of old trees. **87.** The Trossachs. **88.** Glen Lochay, Killin, and Blaeberry Hill, Perth, *Cromb.* 496. Near Fortingal, and Achmore, Killin, 1913.

*Form *discoidea* Cromb. **88.** Inverhaggernie, near Crianlarich.

Between Rannoch Station and Loch Rannoch. Finlarig, 1913. **89.** Near Moulin, and Loch of Lows.

P. ophthalmiza Nyl. On trunks of old pines, &c. **87.** Glen Falloch, 1864, *Carroll* in J. Bot. 1866, 23. **88.** Aged pines in the Black Wood of Rannoch, *Cromb.* South-east side of Loch Earn, 1914.

P. amara Nyl. Trunks of trees, especially sycamore, elm, and beech. Common in all three vice-counties.

P. lactea Nyl. On damp rocks, especially by or near streams. Frequent amongst the mountains. **87.** Pass of Leny and Aberfoyle, 1914. **88.** Creag-na-Caillich, *Cromb.* in J. Bot. 1882, 271. Ben Lawers, *Cromb.* King's Seat, Killin, at 2700 ft., *Watson.* Luib; Loch Earn; near Pitlochry. **89.** Pass of Killiecrankie.

P. communis DC. On the trunks of trees, especially ash and sycamore. Common in all three vice-counties.

Form *rupestris* DC. **87.** Aberfoyle, *Cromb.* **88.** Birnam, *Lindsay* ex *Leight.* ed. 1, 239. Near Killin, at 2000 ft., *Watson.*

P. areolata Nyl. On rocks and walls. **88.** Creag-na-Caillich and Craig Tulloch, *Cromb.* 500.

P. dealbata Nyl. On siliceous rocks. Frequent in all three vice-counties. It ascends to 2800 ft. on Ben-a-Chroin, and 3350 ft., or higher, on Ben Lawers.

Form *corallina* Cromb. **88.** "Upon highland rocks about Finlarig in Breadalbane," *Stuart* ex *Lightfoot*, 66. **89.** Ben-y-Gloe, *Cromb.*

P. ceuthocarpa Turn. & Borr. On rocks. **87.** Cairn on Ben-a-Chroin, 3101 ft., 1913. **88.** Creag-na-Caillich, *Cromb.* 502. Ben Lawers and Ben Laoigh.

*Form *microstictica* Cromb. **88.** On micaceous rock, Allt Inverhaggernie, Crianlarich, 1910.

P. concreta* Nyl. On schistose rocks. **88. Allt Dubh Ghalair, Meall-na-Saone, at 2500 ft., 1903.

Form *Westringii* Nyl. **87.** Ben-a-Chroin, at 3000 ft., and Grey Heights, near Crianlarich, 1913. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 227. Ben Chalum, Ben More, and summit of Am Binnein, 3820 ft.

P. Wulfenii DC. On trunks of trees. **88.** Creag-na-Caillich, *Cromb.* 506. Inverhaggernie, near Crianlarich. **89.** Blair Atholl, *Cromb.*

Var. *rupicola* Nyl. **87.** The Trossachs, *Cromb.* 507.

P. carneopallida Anzi. On the bark of alders. **88.** Glen Lochay, *Cromb.* in J. Bot. 1885, 194.

P. gyrocheila Nyl. On rocks of mica-schist at high altitudes. **88.** Summit of Ben Lawers, 1864, *Carroll* in J. Bot. 1866, 23.

P. leioplaca Schaer. On the bark of trees. Frequent in all three vice-counties.

*Form *hexaspora* Nyl. **88.** Falls of Lochay, 1913.

P. glomerata Schaer. Incrusting dead mosses on high mountains. **88.** North side of Ben Lawers, 1864, *Carroll* in J. Bot. 1865. Creag-na-Caillich, *Maingay* ex *Mudd*, 277. Meall Ghaordie, *Cromb.* ex *Leight.* ed. 1, 244.

Thelotremaceæ.

Phlyctis agelæa* Koerb. On trunks of trees; rare. **89. Near Lawton, 1914.

P. argena* Koerb. On trunks of trees. **88. Achmore Woods, Killin, 1913.

Thelotrema lepadinum Ach. On the smooth bark of trees. **87.** Loch Katrine, *Cromb.* ex *Leight.* ed. 3, 238. Glen Falloch, *Cromb.* The Trossachs, 1914. **88.** Achmore, Killin, *Watson.*

Urceolaria scruposa Ach. Rocks and walls. **88.** Near Fortingal and Killin. **89.** Ben Vrackie and near Dunkeld, *Cromb.* 517.

U. bryophila Nyl. Overspreading mosses and *Cladoniæ.* **88.** Glen Lochay, *Cromb.* ex *Leight.* ed. 1, 235. Blaeberry Hill, *Lindsay* ex *Mudd*, 165. Craig Tulloch, *Cromb.*

Gyrophoraceæ.

Gyrophora proboscidea Ach. On rocks, boulders, and walls in upland and alpine situations. **87.** South side of Am Binnein, at 3520 ft., 1913. **88.** Ben Lawers, *Phytol.* 1843. Ben More, *Cromb.* We saw it there between 3150 and 3750 ft. in 1905. Ben Chalum, at 3200 ft.; Meall Chuirn, at 2980 ft., and Creag-na-Caillich, at 2300 ft. Rocks on the bank of the River Tummel. **89.** Ben Vrackie and Ben-y-Gloe. On wall near Kirkmichael, at 750 ft., 1914.

Form *fimbriata* Mudd. **87.** Stob Coire-an-Lochan, at 3400 ft., 1913. **88.** Ben Lawers, *Borrer.* South side of Loch Rannoch, on wall, at 690 ft. Ben More, at 3700 ft.

*Var. *deplicans* Fr. fil. **88.** Creag-na-Caillich, 2300 ft. **89.** Ben Vrackie, at 2700 ft.

G. cylindrica Ach. In similar situations to the preceding. Common on most of the higher mountains in all three vice-counties from an elevation of 3950 ft. on Ben Lawers to 750 ft. on walls near Kirkmichael. First record—*Lightfoot,* Fl. Scot. 1777, 860, "On the mountains of Breadalbane."

Form *denticulata* Ach. **87.** Ben Laoigh, *Watson.* Glen Falloch. **88.** Ben Lawers!, *Cromb.* 327. Ben Cruichben, Killin, at 3000 ft. Ben Laoigh, at 3500 ft., and summit of Am Binnein, at 3820 ft. Rannoch Moor.

Form *denudata* Mudd. **87.** Stob Coire-an-Lochan, at 3400 ft. **88.** Ben Lawers, *Cromb.* 328. We saw it there at from 3800 to 3950 ft. Creag-na-Caillich and Ben Laoigh.

Form *fimbriata* Ach. As frequent as the type in all three vice-counties, and ascending as high.

*Var. *Delisei* Fr. fil. **88.** Boulder on the shore of Loch Garry, at 1330 ft., 1911. Creag-na-Caillich, at 2300 ft., 1913.

*Var. *tornata* Fr. fil. **88.** Ben Cruichben, Killin, at 3100 ft., 1913.

G. erosa Ach. On high alpine quartzose rocks; rare. **88.** Ben Lawers, *Maingay* ex *Mudd*, 117. **89.** Very sparingly on the summit of Ben-y-Gloe, at 3505 ft., 1912.

G. torrefacta Cromb. Rocks and boulders in alpine or sub-alpine situations. **87.** Ben-a-Chroin, at 3100 ft., 1913. **88.** Ben

Lawers and Ben More !, *Cromb.* 330. Creag-na-Caillich, at 2300 ft., and near Dalnaspidal, at 1400 ft. **89**. Ben-y-Gloe, at 3500 ft., and Ben Vrackie, at 2100 ft.

G. hyperborea Ach. On alpine rocks and boulders; rare. **88**. Ben More, *Cromb.* 331.

G. arctica Ach. High alpine quartzose rocks; rare. **88**. Ben More !, *Cromb. Lichenes*, 40. Seen at about 3600 ft.

G. polyphylla Turn. & Borr. Rocks, boulders, and walls amongst the mountains. Common in all three vice-counties, including forms *monophylla* Turn. & Borr., *congregata* Turn. & Borr., and *lacera* Leight. It ascends to 3100 ft. on Ben-a-Chroin.

Form *glabra* Nyl. **88**. Ben Lawers, *Cromb.* 332. Wall near Kinloch Rannoch.

G. flocculosa Turn. & Borr. In similar situations to the preceding, but much rarer. **88**. Ben Lawers, *Cromb.* 333.

G. polyrrhiza Koerb. On rocks and boulders amongst the mountains. **88**. Near summit of Ben Lawers, *Phytol.* 1843. Amulree and Birnam Hill, *Lindsay* ex *Mudd*, 120. Near Loch Tummel !, *Holmes*. **89**. Spital of Glen Shee, *Lindsay*.

Form *luxurians* Fr. fil. **88**. Ben Lawers and near Tummel Bridge, *Cromb.* 334.

Cladoniaceæ.

Bæomyces rufus DC. On sandy or gravelly banks and stones. Frequent in all three vice-counties.

Var. *subsquamulosus* Nyl. **88**. Glen Lochay, Schiehallion, and Rannoch !, *Cromb.* 111. Ben Chalum, at 3000 ft.

B. placophyllus Ach. On gravelly soil in upland moorland districts. **87**. Loch Katrine, *Jones* ex *Carroll* in J. Bot. 1865, 286. **88**. Ben Lawers, *Jones* ex *Carroll*, *ib.* **89**. Falls of Bruar, *Cromb.*

B. roseus Pers. On damp gravelly turfy soil Frequent in all three vice-counties. It ascends to 2300 ft. on Ben Chalum.

Icmadophila æruginosus DC. On damp turfy soil and rotten stumps of trees. Frequent in all three vice-counties. It ascends to 3500 ft. on Ben-y-Gloe, and to above 2700 ft. on Ben Vrackie.

Pilophorus cereolus Nyl. On moist shady rocks in upland situations. **88**. Ben Lawers, *Cromb.* 115.

P. strumaticus Nyl. On shady ledges of schistose rock. **88**. Glen Lyon, *Cromb.* 115.

Stereocaulon coralloides Fr. On siliceous rocks and boulders. Frequent in all three vice-counties. Although usually rupestral, was seen growing on the trunk of *Pinus sylvestris* near Loch Rannoch in July, 1910. It ascends on Ben Laoigh to 3400 ft.

S. Delisei Bory. Among mosses on granite boulders. **88**. Near Loch Eagh, Rannoch Moor, sterile, *Cromb.* in J. Bot. 1885, 195.

[*S. paschale* Fr. Reported from Ben Lawers (*Phytol.* 1843) and near Birnam, Dunkeld (*Leight.* ed. 1, 77), but probably confounded with the next, and therefore requiring confirmation.]

S. evolutum Graewe. On rocks and walls in upland districts.

Common in all three vice-counties. The highest stations we have noted are 2750 ft. on Meall Chuirn, 3000 ft. on Ben-a-Chroin, and 2800 ft. on Ben-y-Gloe, but it probably ascends higher.

S. tomentosum Fr. Gravelly stony places amongst the mountains, ascending to 3500 ft. or higher on Ben Lawers. **88**. Ben Lawers!, *Lindsay* ex *Leight.* ed. 1, 78. Ben Laoigh, *Travis.* **89**. Ben Vrackie, at 2700 ft.

S. alpinum Lamy. In similar situations to the preceding. **88**. Summit of Ben Lawers!, Birnam Hill, and Blaeberry Hill, near Perth, *Lindsay* ex *Mudd*, 66. King's Seat, Killin, *Watson.* Am Binnein and Ben More, at 3500 ft. Ben Laoigh. **89**. Ben Vrackie.

S. denudatum Floerke. On rocks and boulders in upland and alpine situations. Frequent in all three vice-counties. It ascends to 3200 ft. on Ben Chalum, 3300 ft. on Ben Laoigh, 3750 ft. on Ben More, and 3900 ft. on Ben Lawers.

Form *validum* Lamy. **88**. Ben Lawers, *Cromb.* 120. Ben More, at 3750 ft., 1905.

Form *capitatum* Flot. **88**. Ben Lawers, *Cromb.* 121.

Var. *pulvinatum* Flot. **88**. Ben Lawers (*Phytol.* 1843, as *S. botryosum*, which has not been detected in Britain). Creag-na-Caillich; and Loch Eagh, Rannoch Moor, *Cromb.* Ben More, 1905. **89**. Ben Vrackie, 1912.

S. condensatum Hoffm. Rocks and turf-covered walls, ascending to the cairn on Ben Lawers, 3990 ft. **87**. Glen Falloch. **88**. Aberfeldy, *Cromb.* Ben More, Ben Lawers, and Meall Chuirn, 1912. **89**. Glen Fender, *Cromb.* Above Moulin.

Var. *condyloideum* Nyl. **88**. Ben Lawers, *Cromb.* ex *Leight.* ed. 1, 80. **89**. Glen Fender, *Cromb.*

S. pileatum Ach. On rocks. **88**. Ben Lawers, *Holl* ex *Leight.* ed. 1, 80. Glen Lochay and Glen Ample, *Cromb.*

Leprocaulon nanum Nyl. On earth in the crevices of rocks and on walls and banks. **88**. Glen Lochay!, *Holl* ex *Leight.* ed. 1, 80. **89**. "Near Perth in Den of Balthayock and in various other glens and ravines among the Sidlaw Hills," *Lindsay*, 262. Stenton Hill, Dunkeld, *Lindsay* ex *Mudd*, 67.

Pycnothelia papillaria Duf. On the ground in dry exposed places on mountains or moors, ascending to 2400 ft. on Ben Lawers. **87**. Near the head of Glen Falloch, 1913. **88**. Rare on Ben Lawers!, *Phytol.* 1843. Rannoch, *Cromb.* **89**. Ben Vrackie, at 1400 ft.

Cladonia firma Nyl. **88**. King's Seat, near Killin, at 2800 ft., 1913, *Watson.*

C. pyxidata Fr. On banks, walls, rocks, and about the roots of trees. Frequent in all three vice-counties and very variable, several "forms" sometimes occurring in the same group of plants, such as form *simplex* Roth., form *costata* Flk., and form *syntheta* Ach.

Form *lophyra* Coem. **88**. Rannoch, *Cromb.* 130.

Var. *pocillum* Fr. **88**. Killin and Rannoch, *Cromb.* 130. Glen Lyon. **89**. Invergowrie, *S. Wilson.*

Var. *chlorophæa* Floerke. **88**. Rannoch, *Cromb.* 131. **89**. Blair Atholl, *Cromb.* Pitlochry, 1912.

*Form *lepidophora* Floerke. **88**. Near Fortingal.

Form *myriocarpa* Cromb. **88**. Achmore, near Killin, *Cromb. ib.*

C. pityrea Floerke. Heathery banks, dead stumps of trees, &c. **88**. Rannoch, *Cromb.* 133. **89**. Near Bridge of Cluny, Pitlochry.

Form *hololepis* Floerke. **88**. Glen Lochay, *Cromb. ib.*

C. Lamarkii Nyl. On the ground amongst mosses, &c. **89**. Moulin, near Pitlochry, 1912.

Form *Isignyi* Nyl. **88**. Near the Falls of Tummel, *Cromb.* 134. South side of Loch Rannoch.

C. fimbriata Fr. Mossy banks, tree roots, &c. **87**. Glen Falloch. **88**. Killin !, *Cromb.* 135. Near Fearnan. **89**. Blair Atholl, *Cromb.* Moulin and Pitlochry, 1912.

Var. *conista* Nyl. **88**. Killin, *Cromb.* 136. Glen Lyon. **89**. Invergowrie, *S. Wilson.*

Form *exigua* Cromb. **89**. Invergowrie, *S. Wilson.* Pitlochry and Dunkeld.

Var. *tubæformis* Fr. **88**. Glen Lochay ! and Rannoch, *Cromb.* 136. **89**. Glen Tilt. Strelitz Wood, near Cargill, 1914.

C. fibula Nyl. In similar situations to the preceding. **88**. Glen Lochay, near Killin, *Cromb.* 137. Achmore, near Killin, 1913.

*Form *abortiva* Cromb. **88**. South side of Loch Rannoch, 1905. Near Fortingal. Allt Dubh Ghalair near Killin.

Var. *subcornuta* Nyl. **88**. Killin, *Cromb.* 138.

Form *nemoxyna* Nyl. **88**. Killin, *Cromb. ib.* **89**. Pass of Killiecrankie.

Var. *radiata* Nyl. **88**. Glen Lochay, near Killin, *Cromb.* 139.

C. gracilis Hoffm. Amongst mosses on rocky peaty ground. Common in all three vice-counties. It ascends on Ben More to 3480 ft., and on Ben Chalum to 3200 ft.

Form *abortiva* Schaer. **88**. Rannoch, *Cromb.* 140. Ben Eachan, *Watson.* Meall-na-Saone, at 2300 ft. **89**. Near Bridge of Cluny, Pitlochry.

Var. *hybrida* Schaer. **88**. By Loch Tay, near Killin, *Cromb.* 141.

C. cornuta Fr. **87**. Sherriffmuir, near Stirling, *Cromb.* 142. **88**. Rannoch, *Cromb.* **89**. Pass of Killiecrankie, 1912.

Form *clavulus* Fr. **88**. Rannoch, *Cromb. ib.*

C. ochrochlora Floerke. Rotten tree trunks and turfy ground in wooded upland districts. **87**. Loch Katrine, *Cromb.* 142. **88**. South side of Loch Rannoch.

Form *ceratodes* Floerke. **88**. Rannoch, *Cromb.* 143.

C. verticillata Floerke. Heathy banks and mossy rocks. **88**. Glen Lochay, near Killin, *Cromb.* 143. King's Seat, Killin, and Ben Lawers, at 3900 ft., *Watson.* Meall-na-Saone.

C. cervicornis Schaer. Rocky and heathy ground on mountains and moors. Common in all three vice-counties, ascending to the summits of Ben Lawers and Ben-y-Gloe.

Form *stipata* Nyl. **87**. Glen Falloch, at 1000 ft. **88**. Loch Eagh, Rannoch, *Cromb.* 144. Rannoch Moor.

*Form *basina* Cromb. **89**. Summit of Ben Vrackie (2700 ft.).

C. sobolifera Nyl. On mossy rocks and boulders. **87**. Ben-a-Chroin, at 2200 ft. **88**. Glen Lochay and Rannoch, *Cromb.* 145. Ben Chalum. Near Fortingal. Banks of the River Tummel, 1912. **89**. Ben-y-Gloe and Glen Tilt.

C. macrophylla Nyl. On rock ledges amongst the mountains. **88**. Creag-na-Caillich, *Cromb.* 145. Auchlyne West Burn, Meall-na-Saone, at 1950 ft.

C. degenerans* Floerke. On the ground on mountains or moors. **88. South side of Loch Rannoch. **89**. Ben-y-Gloe, at about 3000 ft., 1912.

Form *haplotea* Floerke. **87**. Pass of Leny, *Cromb.* 146.

*Form *pleolepidea* Nyl. **89**. At above 3000 ft. on Ben-y-Gloe, May, 1912.

Var. *anomœa* Floerke. **88**. Creag-na-Caillich, *Cromb.* 147.

C. trachyna Nyl. In similar situations to the preceding. **88**. Rannoch, *Cromb.* 147.

C. coralloidea Nyl. On wet mountain heaths. **88**. Ben Lawers, *Cromb.* 148. A spadiceous form occurs on Ben Lawers, *Watson.*

C. lepidota Nyl. form *hypophylla* Cromb. On earth amongst rocks in upland districts. **87**. Damyat, near Stirling. **88**. Creag-na-Caillich and Loch Eagh, *Cromb.* 149. Ben Lawers.

C. furcata Hoffm. Heathy and rocky ground and earth-covered walls. Frequent in all three vice-counties.

Form *exilis* Mudd. **88**. Glen Lochay, near Killin, *Cromb.* 150.

Var. *corymbosa* Nyl. **88**. Glen Lochay and Rannoch, *Cromb.* 151.

Var. *spinosa* Hook. Frequent in all three vice-counties. Ascends on Ben Chalum to 3200 ft.

C. racemosa Nyl. Damp peaty soil on mountains and moors. **87**. The Trossachs. Ben Laoigh. **88**. Glen Lochay and Rannoch, *Cromb.* 152. Ben Lawers !, at over 3900 ft., *Watson.* Meall-na-Saone and Meall-nan-Tarmachan.

Form *recurva* Floerke. **88**. Creag-na-Caillich and Rannoch, *Cromb.* 152. Ben Lawers, at over 3900 ft., *Watson.* Am Binnein, at 3700 ft.

C. pungens Floerke. On the ground on heaths and in stony places. **88**. Blaeberry Hill, Perth, *Lindsay* ex *Leight.* ed. 1, 56. Achrioch, Tyndrum, *Watson.*

C. crispata Nyl. On the ground on mountains. **88**. Am Binnein. Ben Chalum. **89**. Ben-y-Gloe, *Cromb.* 155.

C. cenotea Schaer. On rotten stumps of trees. **88**. Black Wood of Rannoch, *Cromb.* 155.

C. scabriuscula* Nyl. Amongst mosses on rocks and walls. **88. South-east side of Loch Earn, 1914.

C. squamosa Hoffm. On mossy peaty ground and on rocks in woods. **87**. Loch Katrine and Bracklinn, *Cromb. Lichenes*, 20. **88**. Rannoch ! and Loch Tay, *Cromb.* Ben Lawers, at over 3900 ft., *Watson.* Loch Tummel. **89**. Pitlochry and Ben-y-Gloe.

Form *cucullata* Nyl. **87**. Near Loch Voil, 1912.

C. adspersa Nyl. In similar situations to the preceding. **88.** Rannoch, *Cromb.* 158.

C. subsquamosa Nyl. On mossy rocks, rotten wood, &c. **87.** Near the foot of Loch Katrine, 1912. **88.** Rannoch, *Cromb.* 158.

C. asperella* Cromb. On heaths, mossy places, in woods, &c. **89. Strelitz Wood, near Cargill.

C. cæspititia Floerke. In similar situations to the preceding. **87.** Loch Katrine, *Cromb.* in *Leight.* ed. 1, 60. **88.** Rannoch, *Cromb.* **89.** Near Pitlochry and Loch of Lows.

C. delicata Floerke. On rotten tree stumps, &c. **88.** Creag-na-Caillich, *Cromb.* 161. Bank of Tummel. **89.** Near Pitlochry and Loch of Lows.

C. coccifera Schaer. Peaty banks on mountains and moors, ascending to the cairn on Ben Lawers, 3990 ft. Frequent in all three vice-counties in the typical state (form *stemmatina* Ach.).

Form *asotea* Mudd. **87.** Ben-a-Chroin, at 2800 ft. **88.** Rannoch, *Cromb.* 162.

Form *cornucopioides* Fr. fil. **88.** Rannoch, *Cromb. ib.* King's Seat, at 2700 ft., *Watson.*

*Form *tenuipes* Del. **89.** Scone, near Perth, *S. Wilson*, 1911.

*Form *extensa* Ach. **88.** Rannoch Moor, 1911. Meall-na-Saone.

Form *incrassata* Fr. **88.** Rannoch, *Cromb.* 163. Achmore Woods, Killin.

Form *alpina* Wain. **88.** Ben Laoigh, at 3300 ft., 1911.

C. pleurota Cromb. On the ground amongst mosses on moors and in woods. **88.** Rannoch, *Cromb.* 163. Ben Lawers. **89.** Ben Vrackie, 1912.

C. luteoalba* Wheld. et Wils. Amongst mosses and lichens on subalpine rocks. **88. Moor near Rannoch Station, 1910.

C. bellidiflora Floerke. On peaty ground amongst mosses on mountains and moors. **88.** Ben Lawers, *Hooker* in *Leight.* ed. 1, 72. Creag-na-Caillich, *Dawson Turner*, *ib.* Rannoch, *Cromb.* King's Seat, Killin, and Ben Laoigh, at 3600 ft., *Watson.* Ben More, Am Binnein, and Meall-nan-Tarmachan. **89.** Ben Vrackie and Ben-y-Gloe.

Form *subuliformis* (Wallr.) Wain. **89.** Ben Vrackie, at 2700 ft.

Form *gracilenta* Floerke. **88.** Rannoch, *Cromb.* 164.

C. deformis Hoffm. In similar situations to the above, and sometimes growing with it. **88.** Creag-na-Caillich and Rannoch, *Cromb.* 165. Glen Lyon and Loch Laidon. **89.** Very fine on Ben-y-Gloe, ascending to the summit.

*Form *gonecha* Nyl. **88.** Ben Cruichben, Killin, 1913.

Form *pulvinata* Nyl. **88.** Rannoch, *Cromb.* 166. **89.** Craig-y-Barns, Dunkeld, *Cromb.* 166. Near Moulin, Pitlochry, and on Ben-y-Gloe.

C. digitata Hoffm. On mossy tree trunks and heathy ground. **87.** Loch Voil and The Trossachs. **88.** Creag-na-Caillich, *Cromb.* 166. King's Seat, Killin, at 2700 ft., *Watson.* Rannoch. **89.** Pitlochry and Glen Tilt, 1912.

Form *cucullata* Nyl. **87.** Near Loch Voil, 1912.

*Form *cerucha* Nyl. **87**. The Trossachs, 1912. **88**. South-east side of Loch Earn, 1914.

C. macilenta Hoffm. On mossy tree trunks, rotten stumps, and peaty banks. Frequent in all three vice-counties.

Form *stryacella* Nyl. **87**. Near Aberfoyle, 1914. **88**. Loch Tummel, *Cromb.* 168. South side of Loch Rannoch.

Form *clavata* Fr. **87**. Pass of Leny. Glen Devon, 1914. **88**. Creag-na-Caillich and Rannoch, *Cromb.* 168.

Var. *scabrosa* Nyl. **87**. The Trossachs. Near Loch Voil. **88**. Glen Lochay and Rannoch, *Cromb.* 169.

Form *intumescens* Cromb. **88**. Rannoch !, *Cromb.* 169. **89**. Ben-y-Gloe, 1912.

Var. *coronata* Nyl. Frequent in all three vice-counties.

Form *carcata* Nyl. **89**. Craig-y-Barns, Dunkeld, *Lindsay* ex *Leight.* ed. 3, 64. Falls of Bruar, *Cromb.* Ben Vrackie, 1912.

C. bacillaris Nyl. On bare peaty soil in mountain districts. **88**. Glen Lochay and Rannoch, *Cromb.* 172.

Form *pityropoda* Nyl. **88**. Rannoch, *Cromb.* 172.

Var. *subcoronata* Nyl. **88**. Glen Lochay, *Cromb. ib.* Near Loch Laidon, Rannoch Moor.

C. Floerkeana Fr. Bare peaty soil on mountains and moors. **88**. Creag-na-Caillich, *Cromb.* 173. Ben Chalum. By Loch Laidon, Rannoch Moor.

Form *trachypoda* Nyl. Commoner than the type. Not unfrequent in all three vice-counties. It ascends to 1700 ft. on Ben Vrackie.

Cladina rangiferina Nyl. Turfy and heathery ground on mountains and moors. **88**. Glen Lochay, Ben Lawers, and Rannoch Moor, *Cromb.* 174. Meall Chuirn, *Watson.* Near the summit of Am Binnein. Banks of the Tummel. **89**. Plentiful on Ben Vrackie above 2700 ft. Ben-y-Gloe up to 3500 ft.

C. sylvatica Nyl. Heaths and moorlands. Common in all three vice-counties. It ascends on Ben Laoigh and Ben-y-Gloe to 3500 ft.

Form *tenuis* Lamy. **88**. Rannoch, *Cromb.* 176. Ben Chalum.

Form *lacerata* Nyl. **88**. Rannoch Moor, *Cromb. ib.* Meall-nan-Tarmachan, at 3400 ft.

Var. *grandis* Cromb. **88**. Rannoch Moor, *Cromb. ib.*

Form *portentosa* Leight. **88**. Rannoch Moor, *Cromb.* 177. Am Binnein.

Var. *alpestris* Nyl. **88**. Glen Lochay. Near summit of Am Binnein, 1911.

Form *pumila* Leight. **88**. Rannoch, *Cromb.* 177. Meall-na-Saone.

C. impexa Harm. Mossy ground on wet moorlands. **88**. Shores of Loch Laidon, Rannoch Moor, 1911.

C. uncialis Nyl. Amongst mosses on mountains and moors, ascending to over 3000 ft. Frequent in all three vice-counties. "Not uncommon in Breadalbane," *Phytol.* 1843.

Form *bolacina* Cromb. **88**. Rannoch Moor, *Cromb.* 178. **89**. Ben-y-Gloe.

Form *leprosa* Del. **88.** Rannoch Moor, *Cromb.* 179.

Form *adunca* Cromb. **88.** Creag-na-Caillich and Rannoch Moor, *Cromb.* 179. Ben Chuirn, Ben Lui, and Ben Lawers, *Watson*! **89.** Ben-y-Gloe.

*Form *integerrima* Wain. **88.** Ben Laoigh, at 3300 ft.

Form *turgescens* Cromb. Frequent on the mountains. **87.** Head of Glen Falloch, at 2000 ft. **88.** Ben Lawers ! and Rannoch, *Cromb.* 179. Ben More, at 3100 ft. Ben Chalum and Ben Cruichben. Rannoch Moor. **89.** Ben-y-Gloe, at 2700 ft.

Form *obtusata* Ach. **87.** Ben-a-Chroin, at 3000 ft. **88.** Creag-na-Caillich and Rannoch Moor, *Cromb.* 180. Ben Chalum, at 3000 ft.

*Form *subobtusata* Arn. **88.** Rannoch Moor. **89.** Ben-y-Gloe, at 3000 ft., 1912.

C. amaurocræa Nyl. Damp heaths on mountains and moors. **88.** Rannoch Moor, *Cromb.* 180. Ben Chalum, at 3000 ft. Meall Chuirn, at 1500 ft.

C. destricta Nyl. Exposed mountain summits and elevated moorlands. **88.** Ben Lawers, *Cromb.* 181. Meall-na-Saone, at 2300 ft. **89.** Ben-y-Gloe, 1912.

Thamnolia vermicularis Schaer. On the ground or amongst mosses on exposed mountain summits and ridges, descending to 2700 ft. on Ben Vrackie. **87.** South side of Am Binnein, at 3500 ft., 1913. **88.** Ben Lawers !, *Turner* ex *Hook.* 65. Creag-na-Caillich, *Cromb.* North side of Am Binnein, at 3750 ft. Ben Laoigh and Meall Chuirn. **89.** Ben Vrackie !, *Cromb.* Ben-y-Gloe, at 3500 ft.

Cœnogoniaceæ.

Cœnogonium ebeneum A. L. Sm. On roots in damp shady places. **87.** The Trossachs. **88.** Killin, *Smith*, 3. Glen Lochay, South-east side of Loch Earn, 1914. Mr. Watson has found corticole examples near Killin. The specimens were named by Miss Smith.

Racodium rupestre Pers. Damp perpendicular or overhanging rocks. **88.** Killin, *Smith*, 4. Achrioch, Tyndrum, *Watson.* Banks of River Tummel. **89.** Dunkeld. Ben Vrackie, at 2700 ft.

Lecideaceæ.

Gyalecta cupularis Schaer. On rocks, preferring those that are calcareous ; more rarely on mosses. **88.** Ben Lawers, *Phytol.* 1841. Creag-na-Caillich and Craig Tulloch, *Cromb.* Ben Laoigh at 2000 ft. **89.** Glen Tilt, on rocks near Clach Glas Bridge, 1912.

G. foveolaris Schaer. Encrusting mosses on the ground in subalpine and alpine situations. **88.** Summit of Ben Lawers, *Carrol & Jones* in J. Bot. 1866, 23. Finlarig, near Killin, *Holl* ex *Leight.* ed. 1, 334. Creag-na-Caillich, *Smith*, 7.

G. geoica Ach. On calcareous soil among rocks and on wall tops. **88.** Ben Lawers, *Jones* ex *Cromb. Lichenes*, 62 Creag-na-Caillich, *Smith.*

G. corticola A. L. Sm. On pine trunks. Rare or overlooked. **88**. Creag-na-Caillich, *Cromb.* in *Grev.* xxii. 8.

Lecidea lurida Ach. On calcareous soil amongst rocks. **87**. South side of Am Binnein, 1913. **88**. Ben Lawers, *Jones* ex *Mudd*, 170.

L. globifera Ach. On the ground and in crevices of rocks on mountains. **88**. Ben Lawers, *Jones & Carroll* ex *Cromb. Lichenes*, 64. **89**. Ben Vrackie, at 2400 ft.

L. rubiformis Wahl. In similar situations to the preceding. **88**. Summit of Ben Lawers, *Jones & Carroll* in J. Bot. 1865, 289.

L. rhizobola Nyl. On the ground amongst rocks in alpine situations. **88**. Summit of Ben Lawers, rare, *Jones* ex *Carroll*, J. Bot. 1865, 289.

L. glaucolepidea Nyl. On peaty ground amongst the mountains. **87**. Glen Falloch, *Smith*, 14. **88**. Rannoch, *Smith*, 14.

L. decipiens Ach. On calcareous soil. **88**. Ben Lawers, *Maingay* ex *Mudd*, 171. Killin, *Cromb. Lichenes*, 76. Creag-na-Caillich, *Smith*, 16. **89**. Ben Vrackie, at 2700 ft., 1912.

L. lugubris Sommerf. On micaceous rocks and boulders. **88**. Ben Lawers, *Macmillan* ex *Leight.* ed. 1, 255. Craig Tulloch, *Cromb.* Rannoch, *Stirt.* in Scottish Nat. 1880, 1. **89**. Glen Fender, *Cromb.* in *Grev.* i. 170.

Var. *lugubrior* A. L. Sm. **88**. South side of Loch Rannoch. **89**. Glen Fender, *Cromb.* ex *Smith*, 17.

L. prostratula Stirt. On rocks. **88**. Craig Var near Kinloch Rannoch. *Stirt.* in Scottish Nat. 1880, 2.

L. confertula Stirt. On rocks. **89**. Near Killiecrankie, *Stirt.* in Trans. Glasgow Soc. Nat. 1875–86.

L. hypocyanea Stirt. On the ground amongst the mountains. **88**. At the foot of Ben Lawers, *Stirt.* in Scottish Nat. 1880, 2.

L. lucida Ach. Shaded rocks, and more commonly on stones in walls. Frequent in all three vice-counties. "Plentiful and well fruited, Glen Fender," *Cromb.* in *Grev.* i. 170.

Form *thiotea* Ach. **88** or **89**? Falls of Tummel, 1871. *Cromb.* in *Grev.* i. 170.

L. phæops Nyl. On rocks, chiefly schistose, usually near water, in mountainous districts. **88**. Ben Lawers, with form *major* Nyl. *Cromb. Lichenes*, 66. Ben Cruichben, Killin, at 3200 ft., 1913.

L. lithophiliza Nyl. On schistose rocks and walls. **88**. Crianlarich, Ben Lawers and Craig Tulloch, *Smith*, 21.

L. coarctata Nyl. On walls and rocks. **87**. Glen Falloch. **88**. Shore of Loch Tummel, 1912. **89**. Bridge of Cluny, near Pitlochry, 1912.

Var. *elacista* Cromb. The most frequent form at low altitudes. **88**. Killin, *Piggott* ex *Leight.* ed. 1, 279. Craig Tulloch, *Cromb.* Ben Lawers, *Smith*, 23. Birnam Hill, *Lindsay*. South-east side of Loch Earn, 1914. **89**. Glen Tilt.

*Form *cotaria* Cromb. **88**. Ben Laoigh, at 2500 ft., 1911.

Var. *glebulosa* Cromb. (*Lichen glebulosus* Sm. and *Lecidea coarctata* form *ornata* Leight.) Rocks and walls and on earth,

ascending to 3800 ft. on Ben Lawers. **88.** Ben Lawers! *Holl* ex *Leight.* ed. 1, 280. Craig Tulloch, *Cromb.* Near Killin, *Watson.* Ben Chalum. **89.** Kinnoull Hill, *Lindsay* ex *Leight.* ed. 1, 280.

L. Brujeriana Nyl. On schistose rocks in mountain districts. **88.** Ben Lawers, *Smith*, 25.

L. granulosa Schaer. Bare peaty ground on moors; sometimes on stumps of dead firs. Frequent in moorland parts of all three vice-counties, as also is the var. *escharoides* Schaer. The latter at over 3900 ft. on Ben Lawers, *Watson.*

L. flexuosa Nyl. Old palings and stumps of trees, especially larch. **87.** Glen Falloch, *Cromb.* **88.** Killin! *Cromb.* ex *Leight.* ed. 1, 260. Creag-na-Caillich and Achmore, *Smith*, 27.

Form *æruginosa* Leight. **88.** Killin, *Cromb. Lichenes*, 66.

L. gelatinosa Floerke. On bare ground or creeping over mosses. **87.** Glen Falloch. **88.** Aberfeldy, *Smith*, 28.

L. demissa Th. Fr. On peaty and gravelly soils and earth-capped walls, more rarely on schistose rocks. Probably frequent. It ascends to 3600 ft. or higher. **88.** Ben Lawers! *Cromb.* ex *Leight.* ed. 1, 250. Crianlarich !, *Holl, ib.* Creag-na-Caillich and Loch Ericht, *Smith*, 30. Near the summit of Ben Laoigh. **89.** Ben-y-Vrackie and Ben-y-Gloe.

L. uliginosa Ach. Peaty and sandy soil, and mossy stumps of trees. Frequent in all three vice-counties.

Var. *humosa* Ach. **88.** Ben Lawers and Rannoch, *Smith*, 31. Ben Lawers, at 3940 ft., 1913.

L. fuliginea Ach. On old palings and dead wood. **87.** Glen Falloch, *Smith*, 32. **88.** Ben Lawers and Creag-na-Caillich, *Smith*, 32. **89.** Glen Tilt. Near Loch of Butterston, Dunkeld, 1912.

L. perobscura Nyl. On old fir palings. **88.** Near Killin, but sparingly, 1873. *Cromb.* in *Grev.* ii. 140.

L. vernalis Ach. On decayed mosses on the ground, and on rocks in alpine situations. **88.** Near the summit of Ben Lawers, *Jones* ex *Carroll*, J. Bot. 1865, 290. Above Lochan-a-Chait, *Smith*, 33.

L. minor Nyl. On the smooth bark of trees. **88.** Finlarig, *Smith*, 33.

L. tenebricosa Nyl. On tree trunks in wooded upland districts. **87.** Glen Falloch, *Smith*, 35. **88.** Finlarig, near Killin, *Smith*, 35.

L. cuprea Sommerf. On the ground in alpine situations. **88.** Near the summit of Ben Lawers, *Cromb. Lichenes*, 68.

L. Berengeriana Th. Fr. Encrusting decayed mosses on the ground on mountains. **88.** Near the summit of Ben Lawers! *Carroll & Jones* in J. Bot. 1866, 22.

Var. *lecanodes* Nyl. **88.** Ben Lawers, 1871, *Stirt.* in *Grev.* ii. 71.

L. cupreiformis Nyl. In similar situations to the preceding. **88.** Above Lochan-a-Chait, *Jones & Cromb.* ex *Cromb. Lichenes*, 68.

L. ochrococca Nyl. On trunks of trees in wooded mountain districts. **87.** Glen Falloch, *Carroll* in J. Bot. 1865, 286. **88.** Ben Lawers and Black Wood of Rannoch, *Smith*, 36. **89.** Glen Tilt, on decorticated stumps, 1912.

L. sanguineoatra Ach. Creeping over mosses on rocks, and more rarely on dead wood in mountain districts. **87**. Glen Falloch, *Holl* ex *Leight.* ed. 1, 268. **88**. Ben Lawers, *Jones* ex *Carroll* in J. Bot. 1865, 286.

L. atrofusca Nyl. On mossy rocks in mountainous districts. **88**. Summit of Ben Lawers, *Jones & Carroll* in J. Bot. 1866, 22 (as *L. fusca* Schaer.). South of Loch Tay, *Smith*, 37. Meall-na-Saone at 2350 ft.

Form *congesta* Cromb. **88**. Creag-na-Caillich, *Smith*, 38.

Var. *Templetoni* Wainio. **88**. Ben Lawers, *Jones* ex *Mudd*, 189.

L. fuscorubens Nyl. On calcareous rocks in mountain districts. **88**. Ben Lawers, *Cromb. Lichenes*, 68. Craig Tulloch, *Cromb.* Near Fortingal, Glen Lyon, 1911. Ben Cruichben, at 3100 ft., 1913.

L. albohyalina Nyl. On smooth bark and decorticated trunks of trees in mountainous districts. **88**. Creag-na-Caillich, *Smith*, 39.

L. immersa Ach. On calcareous rocks. **88**. Ben Lawers, *Cromb. Lichenes*, 81.

L. ochracea Wedd. On calcareous rocks. **88**. Ben Lawers, *Smith*, 41.

L. turgidula Fr. On old palings and dead stumps of trees. **87**. Glen Falloch, *Smith*, 41. **88**. Killin, *Cromb. Lichenes*, 69. Black Wood of Rannoch, *Smith, ib.* **89**. Killiecrankie, *Cromb.* in *Grev.* i. 170. Glen Fender, *Smith, ib.*

Var. *endopella* Cromb. **89**. Glen Fender, *Cromb.* in J. Bot. 1871, 178.

Var. *pithyophila* Nyl. **88**. Achmore and Killin, 1872, *Cromb.* **89**. Glen Fender, *Cromb.* in J. Bot. 1873, 134.

L. filamentosa Stirt. On worked wood. **88**. Near Killin, *Stirt.* in Scottish Nat. 1880, 2.

L. misella Nyl. On old fir palings. **88**. Near Loch Tummel, 1870, *Cromb.* in *Grev.* i. 172.

L. breadalbanensis Stirt. On mosses and hepatics. **88**. Ben Lawers, *Stirt.* in Trans. Glasgow Soc. Nat. 1875, 87.

L. picila Leight. On rocks in upland districts. **88**. Craig Tulloch, *Smith*, 47.

L. botryiza Nyl. On schistose rocks. **88**. Ben Voirlich, 1871. *Stirt.* in *Grev.* ii. 71.

L. leptostigma Nyl. On mica-schist rocks. **88**. "On a micaceous weathered boulder near Loch-na-Gat on Ben Lawers, apparently extremely rare," *Cromb.* in J. Bot. 1868, 49.

L. calpodes Stirt. On rocks. **89**. Killiecrankie, Trans. Glasgow Soc. Nat. 1875, 88.

L. protrusa* Fr. On rocks and stones. **89. Near Moulin, Pitlochry, 1912.

L. parasema Ach. On trunks of trees and old palings. Frequent in all three vice-counties.

*Form *tabescens* Stiz. **89**. Near Pitlochry, 1912.

Var. *limitata* Ach. **87**. The Trossachs. **88**. Glen Lochay! Killin, *Smith*, 53.

Var. *flavens* Nyl. **88**. Breadalbane, *Cromb.* ex *Leight.* ed. 1,

270. Glen Lochay and near Kenmore. **89**. Glen Tilt, on birch stumps.

*Var. *elæochroma* Ach. **88**. Near shore of Loch Tay, Fearnan. Loch Tummel and Loch Earn, 1914.

L. latypea Ach. On schistose rocks. **88**. Ben Lawers, *Jones* ex *Mudd*, 202.

L. sublatypea Leight. On schistose and siliceous rocks on or amongst the mountains, ascending to 3390 ft. or higher on Ben Lawers. **88**. Ben Lawers !, *Smith*, 54. Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 271. Glen Lochay, 1913. **89**. Glen Fender, *Cromb.* in *Grev.* 170. King's Seat, Sidlaw Hills.

L. goniophila Schaer. On rocks and walls, ascending to over 3700 ft. **88**. Creag-na-Caillich and Craig Tulloch, *Smith*, 55. Near the summit of Am Binnein, 1911. Ben Lawers. **89**. Glen Tilt, *Smith*, 55.

L. inserena Nyl. On mountain rocks. **88**. Ben Lawers, *Smith*, 55.

L. asema* Nyl. On schistose rocks. **87. The Trossachs. The thallus is more continuous than usual, judging from descriptions, and the spores in our examples measure 14 × 8 mm.

L. leucophæa Nyl. On rocks on mountains ascending to over 3900 ft. **88**. Ben Lawers, *Cromb.* ex *Leight.* ed. 3, 178 (under *Lecanora*). Craig Tulloch, *Cromb.* Rannoch, *Stirt.* in Scottish Nat. 1880, 1. Ben Lawers at over 3900 ft. *Watson*, 1912. **89**. "On quartzose boulders near the summit of Cairn Gowar," *Cromb.* in *Grev.* i. 170.

L. nigroglomerata Leight. On quartzose rocks in alpine situations. **89**. Summit of Cairn Gowar, 1870, *Cromb.* in *Grev.* i. 170.

L. scotinodes Nyl. On schistose rocks. **88**. Craig Tulloch, 1871, *Cromb.* ex *Leight.* ed. 3, 330.

L. vitellinaria Nyl. Parasitic on the thallus of *Lecanora vitellina* on rocks and walls. **88**. "Base of Ben Lawers [near Lawers Inn]," *Cromb. Lichenes*, 78. Wall in Glen Lochay, 1913. **89**. Blair Atholl, *Smith*, 60.

L. fuliginosa Tayl. On siliceous mountain rocks. **88**. Crianlarich, *Holl* ex *Leight.* ed. 1, 255. Achmore, Killin, 1913. **89**. Glen Fender, *Smith*, 60.

L. arctica Sommerf. Encrusting mosses on the higher mountains; ascending on Ben Lawers to 3900 ft. **87**. Ben Laoigh !, at 3700 ft., *Watson*. Ben-a-Chroin, 1913. **88**. Ben Lawers !, 1860, *Adm. Jones & Lindsay* ex *Mudd*, 200. Creag-na-Caillich, *Smith*, 61. **89**. Ben Vrackie !, *Smith*, 61. Ben-y-Gloe, at 3500 ft., 1912.

L. limosa Ach. On earth and mosses on the higher mountains, occurring up to 3900 ft. or higher. **87**. Summit of Ben-a-Chroin. **88**. Ben Lawers !, *Maingay* ex *Mudd*, 200. Ben Laoigh and Ben Chalum. **89**. Cairn Gowar, *Cromb.* in *Grev.* i. 170. Ben-y-Gloe, at 3500 ft., and Ben Vrackie, at 2700 ft., 1912.

L. alpestris Sommerf. In similar situations to the preceding, and ascending as high. **87**. Ben-a-Chroin, at 3050 ft., 1913.

88. Summit of Ben Lawers!, *Jones & Carroll* in J. Bot. 1866, 24.

L. subfurva Nyl. On micaceous rocks and walls. **88.** Loch Earn! and Ben Lawers, *Smith*, 62. Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 250. Creag-na-Caillich, 1913. **89.** Glen Fender, *Cromb.* in *Grev.* i. 170.

L. deparcula Nyl. On stones, upon or amongst the mountains, ascending to over 3800 ft. **88.** Choninish, near Tyndrum, and summit of Am Binnein, 1911. **89.** Summit of Ben-y-Gloe, *Cromb.* in *Grev.* i. 62.

L. dealbatula Nyl. On schistose mountain rocks. **88.** Stronaclachich, near Killin, *Cromb.* in *Grev.* iii. 23. Lochan-a-Chait, *Smith*, 63.

L. tabidula Nyl. On quartzose alpine rocks. **88.** Summit of Am Binnein, 1911. **89.** Summit of Ben-y-Gloe, *Cromb.* in *Grev.* viii. 112.

L. jurana Schaer. On calcareous rocks. **87.** Ben-a-Chroin, at 2500 ft., 1913. **88.** Craig Tulloch, *Smith*, 64. Ben Laoigh, at 3200 ft. South-east side of Loch Earn.

Form *dispersa* Arnold. **88.** On schistose stones, Meall-na-Saone.

L. consentiens Nyl. On schistose alpine rocks. **87.** Ben-a-Chroin. **88.** Near summit of Ben Lawers, *Jones* ex *Carroll* in J. Bot. 1867, 255. Above Lochan-a-Chait, and (with also form *circumcissa* Nyl.) on Creag-na-Caillich, *Smith*, 65.

L. panæola Ach. Siliceous and schistose mountain rocks. **87.** Glen Falloch, *Smith*, 66. **88.** Ben Lawers!, *Maingay* ex *Mudd*, 164. Creag-na-Caillich and Crianlarich, *Smith*, 66. Above Lochan-a Chait, at 2900 ft., 1913.

L. phæenterodes Nyl. On alpine rocks. **88.** Ben Lawers, *Cromb.* ex *Smith*, 66.

L. areolata Schaer. On schistose rocks in mountain districts. **88.** Ben Lawers, *Jones* ex *Cromb. Lichenes*, 82.

L. contigua Fr. On rocks and stones. Common in all three vice-counties. It ascends to 3990 ft. on Ben Lawers.

Form *nobilis* Fr. **88.** South-east side of Loch Earn, 1914.

Form *leprosa* Leight. **88.** Ben Lawers, at 3200 ft., 1913.

Form *limitata* Leight. **88.** South-east side of Loch Earn, 1914.

Var. *platycarpa* Fr. **87.** Ben Laoigh!, *Watson.* **88.** Amulree, *Lindsay* ex *Leight.* ed. 3, 300. Ben Lawers!, *Smith*, 68. Meall-nan-Tarmachan, *Watson.* Ben Laoigh, at 3200 ft.

Var. *flavicunda* Nyl. **87.** Glen Falloch. Ben Laoigh, *Travis*, also *Watson.* **88.** Amulree, *Lindsay* ex *Leight.* ed. 1. 294. Ben Lawers, *Smith*, 68. Ben Chalum, Ben Laoigh and Rannoch. **89.** Ben-y-Gloe.

L. sorediza Nyl. On rocks. **87.** The Trossachs, *Smith*, 69. Ben Laoigh, *Watson.* Near Crianlarich, 1913. **88.** Ben Laoigh, *Watson.* Ben Chalum, at 3200 ft. Glen Lochay and Loch Tummel. **89.** Near Dunkeld.

L. tenebrans* Nyl. On schistose mountain-rocks. **88. Meall Chuirn, at 3007 ft., 1912.

L. albocærulescens Ach. On rocks and walls. **87**. The Trossachs. **88**. Near Achmore, Killin !, *Smith*, 70. Ben Laoigh, at 3000 ft.

Var. *alpina* Schaer. **88**. Near Loch Tummel, 1912. **89**. Ben-y-Gloe.

Var. *flavocærulescens* (Ach.). **88**. Stream near Rannoch Railway Station, 1910. Ben Laoigh, at 3200 ft.

L. crustulata* Koerb. On siliceous rocks. **87. Ben Laoigh, *Watson*. Am Binnein, at 3700 ft., 1913. **88**. Ben Lawers, at 3900 ft., *Watson*. Ben Laoigh ; Ben Chalum ; and shore of Loch Tummel. **89**. Dunkeld.

*Var. *meiospora* Olivier. **88**. Crianlarich, *Smith*, 2. Meall Chuirn, at 2950 ft. South-east side of Loch Earn, 1914.

*Var. *fuscella* Mudd. **89**. On small stones, King's Seat, Sidlaw Hills, 1914.

L. confluens Ach. On rocks and walls. Frequent in all three vice-counties, ascending to 3900 ft. or higher.

Form *minor* Leight. **88**. Ben Cruichben, Killin, at 3000 ft. 1913.

Form *oxydata* Leight. **88**. Ben Lawers !, *Smith*, 73. Ben Chalum, at 3000 ft. Am Binnein, at 3850 ft.

L. cinerascens A. L. Sm. On rocks in mountain districts. **87**. Ben-a-Chroin, 1913. **88**. Frequent in this vice-county, ascending to 3800 ft. or higher on Ben Lawers. **89**. Ben Vrackie and Glen Tilt.

L. silacea Ach. On rocks. **89**. Glen Fender, 1870, *Cromb*. in *Grev*. i. 170. Sidlaw Hills, *Smith*, 74. Ben Vrackie, 1912.

L. tessellata Floerke. On alpine rocks. **87**. Ben Laoigh, *Watson*. **88**. Ben Lawers, *Jones & Carroll* in J. Bot. 1866, 22. **89**. Ben-y-Gloe, 1912.

L. lapicida Ach. On schistose rocks in upland districts, ascending to about 3800 ft. on Ben Lawers. **87**. Glen Falloch, and Ben-a-Chroin, at 3100 ft. **88**. Ben Chalum and Ben Lawers. **89**. Blair Atholl, *Cromb*. ex *Leight*. ed. 1, 285. Pitlochry and Ben-y-Gloe, 1912.

Var. *declinans* Nyl. **88**. Ben Lawers, *Carroll*. Lochan-a-Chait, 1913.

L. lithophila Ach. Rocks in upland or mountain districts. Frequent in all three vice-counties, ascending to 3200 ft. on Ben Laoigh.

Form *minor* Cromb. **88**. Ben Lawers, *Cromb*. ex *Smith*, 76. Ben Laoigh. Ben Chalum, at 1800 ft.

Form *ochracea* Nyl. **88**. Craig Tulloch, *Cromb*. ex *Smith*, 76. **89**. Glen Fender, *Cromb*.

L. plana Nyl. On mountain rocks and boulders of schist. **87**. Ben-a-Chroin. South side of Am Binnein, at 3400 ft. **88**. Frequent in this vice-county, ascending to 3900 ft. on Ben Lawers. **89**. Glen Fender, *Cromb*. in Grev. i. 170.

L. mesotropoides Nyl. On calcareous or schistose stones. **88**. Craig Tulloch, 1871, *Cromb*. ex *Leight*. ed. 3, 283.

L. lactea Floerke. On siliceous rocks in mountain districts,

ascending to 3900 ft. on Ben Lawers. **88.** Ben Lawers!, *Jones* ex *Mudd*, 206. Falls of Tummel, *Cromb.* Meall-nan-Tarmachan; Ben Chalum; Am Binnein, at 3800 ft.; Glen Eagles, 1914. **89.** Near Pitlochry.

L. subkochiana* Cromb. In similar situations to the preceding. **88. Ben Chalum, at 2700 ft.

L. auriculata Th. Fr. Rocks in mountain districts, ascending to the summit of Ben Lawers. Frequent. **87.** Ben Laoigh, *Watson.* **88.** Frequent on the mountains. **89.** Near the summit of Cairn Gowar, *Cromb.* in *Grev.* i. 170. Ben-y-Gloe, 1912.

Var. *diducens* Th. Fr. **87.** Ben Laoigh, *Watson.* **88.** Ben Lawers, *Smith*, 80. Ben Laoigh, at 3200 ft. **89.** Ben Vrackie and Ben-y-Gloe, *Smith*, 80.

L. umbonella Nyl. On alpine rocks. **88.** Ben More, *Smith*, 81.

L. aglæa Sommerf. On granitic or schistose rocks on mountains. **87.** Near Aberfoyle. **88.** Ben Lawers, *Carroll* in J. Bot. 1866, 24. Creag-na-Caillich and Craig Tulloch, *Cromb.* **89.** Ben Vrackie and summit of Ben-y-Gloe, 1912.

Form *Crombici* Nyl. **88.** Ben Lawers, *Holl* ex *Cromb. Lichenes*, 83. Craig Tulloch, *Cromb.*

L. armeniaca Nyl. On schistose rocks on the higher mountains.

Var. *aglæoides* Nyl. **88.** Creag-na-Caillich, *Cromb. Lichenes*, 83.

Var. *lutescens* Nyl. **88.** Near the summit of Ben Lawers, *Smith*, 84.

L. marginata Schaer. On schistose alpine rocks. **88.** Ben Lawers, 1868, *Jones* ex *Cromb. Lichenes*, 83.

L. fuscoatra Ach. On siliceous rocks in mountain districts, ascending to about 3900 ft. **87.** Aberfoyle. **88.** Summit of Ben Lawers, *Dickson* in *Hook.* 37. Am Binnein, on quartz at 3820 ft. Glen Eagles, 1914. **89.** Ben-y-Gloe.

Var. *grisella* Nyl. **88.** Ben Lawers, *Smith*, 85.

Var. *Mosigii* Nyl. **88.** Creag-na-Caillich, *Smith*, 86. Ben Chalum, at 2800 ft.

L. nigrogrisea Nyl. On rocks and walls. **88.** Craig Tulloch, *Smith*, 86. Glen Dochart and Fortingal. Glen Eagles, 1914.

L. rivulosa Ach. On rocks, chiefly quartzose. Frequent in all three vice-counties. Noted up to 3000 ft. on Ben-a-Chroin, and 2700 ft. on Ben Vrackie.

L. recensa Stirt. On rocks. **88.** Craig Var, near Kinloch Rannoch, *Stirt.* in Scottish Nat. 1880, 3. Nearly related to, and perhaps only a variety of, *L. rivulosa.*

L. Kochiana Hepp. On siliceous rocks and boulders, especially on the mountains. Noted up to 2950 ft. on Meall Chuirn, and 2800 ft. on Ben-y-Gloe. **88.** Craig Rossie, The Ochils, *Smith*, 88. Ben More; Am Binnein; Ben Chalum and Meall Chuirn. Near the River Tummel, Pitlochry, at about 400 ft., 1912. **89.** Ben-y-Gloe!, *Smith*, 88.

Var. *lygæa* Leight. **87.** Glen Devon, 1914. **88.** Crianlarich, *Smith*, 89. Ben More, at 3600 ft., on quartz.

L. griseoatra Schaer. In similar situations to the preceding. **87**. Shore of Loch Voil, 1912. **88**. Crianlarich and Ben Lawers!, *Smith*, 91. On quartz at the summit of Am Binnein (3820 ft.). Ben Chalum, and near Fortingal. **89**. Ben-y-Gloe!, *Smith*, 91. Near Loch of Lows, Dunkeld. King's Seat, Sidlaw Hills.

L. fuscocinerea Nyl. On schistose rocks. **88**. Ben Lawers, *Smith*, 92. Near Fortingal, 1911. **89**. Ben Vrackie, *Smith*, 92. Near Moulin; and Loch of Lows, &c., near Dunkeld. Ben-y-Gloe, at above 2000 ft., 1912.

L. atrofuscescens Nyl. On rocks and boulders. **88**. Lower slopes of Ben Lawers, 1864, *Carroll* ex *Cromb. Lichenes*, 83. Ben Chalum, at 2800 ft.

L. relicta Stirt. On rocks. **89**. Blair Atholl, *Stirton* in Trans. Glasgow Soc. Nat. 1875, 89.

L. phyllodisca Stirt. On rocks. **89**. Killiecrankie, *Stirton, ut supra*, 86.

L. aniptiza Stirt. On decorticated wood. **89**. Near Killiecrankie, *Stirton, ut supra*, 85.

L. furvella Nyl. On micaceo-schistose rocks and walls in mountain districts. **88**. Ben Lawers, *Jones* ex *Mudd*, 207. Craig Tulloch, *Smith*, 94. **89**. Foot of Ben-y-Gloe, Ben Vrackie and Glen Fender, *Cromb.* ex *Leight.* ed. 1, 272.

L. amphiplecta Stirt. On rocks in mountain districts. **88**. Ben Lawers, *Stirton* in Scottish Nat. 1880, 3.

L. asperella Stirt. On rocks. **89**. Ben-y-Gloe, *Stirton* in Trans. Glasgow Soc. Nat. 1875, 87.

L. confusula Nyl. On micaceous rocks and walls. **88**. Craig Tulloch, 1871, *Cromb.* ex *Leight.* ed. 3, 266.

L. segregans Nyl. On rocks of mica-schist. **88**. Ben Lawers, *Jones* ex *Carroll* in J. Bot. 1867, 255.

L. neglecta Nyl. Encrusting mosses on mountains. **88**. Ben Lawers, "frequent but without apothecia," *Carroll* in J. Bot. 1866, 22.

L. dasæa Stirt. On timber. **88**. Near Ben Lawers, *Stirton* in Scottish Nat. 1880, 3.

L. enclitica Nyl. On old fir palings. **89**. Pass of Killiecrankie, *Cromb.* in *Grev.* i. 170. Glen Fender, *Smith*, 101.

L. pycnocarpa Koerb. On rocks. **88**. Ben Lawers and Craig Tulloch, *Smith*, 102. Ben Laoigh, *Watson*. **89**. Ben-y-Gloe, *Smith, ib.*

L. assimilis Th. Fr. On rocks. **88**. Ben Lawers, *Smith, ib.* We found it there at 3000 ft. in 1913.

L. restricta Stirton. On rocks. **89**. Blair Atholl, *Dr. Stirton* in Trans. Glasgow Soc. Nat. 1875, 88.

L. oxyspora Nyl. Parasitic on various species of *Parmelia*, &c. **87**. Pass of Leny, *Smith*, 104. **88**. Strath Bran Road, Dunkeld, and Moncrieffe Hill, *Linsay* ex *Mudd*, 225. Breadalbane, *Cromb. Lichenes*, 92. Creag-na-Caillich, *Smith*, 104. On *Parmelia fuliginosa* var. *lætevirens*, near Kinloch Rannoch, 1910.

Megalospora sanguinaria Ach. On trunks of trees, especially pine, or encrusting mosses on rocks. Frequent in all three vice-counties.

Form *microcarpa* Nyl. **88.** Creag-na-Caillich, *Smith*, 106.

M. melina Krempelh. On trunks of firs in mountain districts. **88**. Ben Lawers, *Stirt.* in *Grev.* ii. 60 (as *Lecidea didymospora* Stirt.).

M. subsanguinaria nob. (*L. sanguinaria* * *subsanguinaria* Stirt.). On bark. **88**. Near Kinloch Rannoch, *Stirt.* in Scottish Nat. 1880, 2. Seems to be specifically distinct, and recognizable by the medulla, wider spores, and yellow coloration on application of KHO.

M. fucata nob. (*Lecidea fucata* Stirt. in Scottish Nat. 1879, 16). On decorticated wood. **88**. Near Tyndrum, *Stirt., loc. cit.*

Biatorella fossarum Th. Fr. On mosses amongst alpine rocks. **88**. "On Ben Lawers, near the head of the ravine, where the saxifrages are usually got, 1868." *Walter Galt* in *Grev.* i. 75.

B. resinæ Th. Fr. On pine trunks in mountain districts. **88**. Creag-na-Caillich and Ben Lawers, *Smith*, 109.

B. moriformis* Th. Fr. On decorticated wood. **87. On an indurated birch stump, Glen Falloch, 1913.

B. morio Mudd. On rocks. **88.** Ben Lawers, *Smith*, 110. Glen Lochay. **89.** Ben-y-Vrackie, at 1000 ft.

*Var. *coracina* Schaer. **87.** Stones on the shore of Loch Ard and Aberfoyle, 1914.

Biatorina cæruleonigricans A. L. Sm. On earth amongst calcareous rocks. **88**. Ben Lawers, *Holl* ex *Leight.* ed. 1, 314. Craig Tulloch, *Cromb.*

B. candida Jatta. On decayed mosses or on earth amongst rocks in alpine situations. **88**. Ben Lawers, *Jones & Cromb.* in *Cromb. Lichenes*, 77. Craig Tulloch, *Cromb.* Creag-na-Caillich and head of Lochan-a-Chait, *Smith*, 112.

B. cumulata* Th. Fr. On the ground amongst mosses in alpine situations. **89. Ben Vrackie, at 2700 ft. amongst *Polytrichum piliferum* and *Cladina rangiferina*, 1912.

B. diluta Th. Fr. On pine trunks. **87**. Glen Falloch, *Smith*, 114. **88**. Ben Lawers, *Smith, ib.*

B. pilularis Koerb. On mossy tree trunks. **88**. Aberfeldy, *Smith*, 116. Glen Lochay, Killin and Ben Lawers, *Smith, ib.*

B. graniformis* A. L. Sm. On old palings and trunks of trees. **87. Near Loch Voil, November, 1912.

B. cyrtella Th. Fr. On tree trunks. **87**. Glen Falloch, *Smith*, 118. **88**. Glen Dochart, near Killin, 1913.

B. Griffithii Massal. On the smooth bark of trees. **87.** Glen Falloch, *Holl* in *Leight.* ed. 1, 321. **88**. Rannoch Moor.

B. erysiboides Th. Fr. form *pallida* Nyl. On decaying trunks and stumps of trees. **87.** Loch Katrine, *Cromb. Lichenes*, 73.

B. globulosa Koerb. On the bark of trees. **87.** Loch Katrine, *Cromb.* ex *Leight.* ed. 1, 320.

B. spodiza A. L. Sm. On old fir palings. **88**. Killin, *Cromb.* in *Grev.* ii. 140.

B. synothea Koerb. On old palings or decorticated trees. **87.** Glen Falloch, *Cromb. Lichenes*, 70. **88**. Finlarig, Killin, *Cromb., ib.* **89**. Glen Tilt.

B. subnigrata A. L. Sm. On schistose rocks, ascending to 2800 ft. on Ben Lawers. **88.** Ben Lawers! and Crianlarich, *Holl* ex *Leight.* ed. 1, 317. Craig Tulloch, *Cromb.*

B. premnea A. L. Sm. On trunks of trees. **87.** Glen Falloch, *Smith*, 123. **88.** Kenmore, *Holl* ex *Leight.* ed. 1, 311. Finlarig and Glen Lochay! *Cromb.* Kinloch Rannoch. **89.** Glen Tilt, 1912.

B. pulverea Mudd. On trunks of old trees, generally near the roots. **87.** Glen Falloch, *Holl* ex *Leight.* ed. 1, 322. **88.** Aberfeldy, *Holl* ex *Cromb. Lichenes*, 89. Glen Lochay, *Smith*, 124.

B. Lightfootii* Mudd. On the smooth bark of trees. **88. Trees by Loch Tay, near Fearnan, 1911.

B. lenticularis Koerb. On rocks. **88.** Craig Tulloch, *Cromb.* **89.** Glack Mill Dam, Dunkeld.

Form *nigricans* Arnold. **88.** Bank of the Dochart, Killin, 1913.

Var. *erubescens* Koerb. **88.** Craig Tulloch, *Smith*, 127.

B. rhypodiza A. L. Sm. On alpine schistose rocks. **88.** Summit of Creag-na-Caillich, *Cromb.* in *Grev.* x. 23.

B. chalybeia Mudd. On siliceous rocks and stones. **88.** Ben Lawers, *Cromb. Lichenes*, 91. **89.** On stones, King's Seat, Sidlaw Hills, 1914.

B. contristans A. L. Sm. On decaying mosses in mountain districts. **87.** On *Andreæa*, Glen Falloch, at 1000 ft., 1913. **88.** "Abundant on mosses near summit of Ben Lawers, 1864," *Carroll & Jones* in J. Bot. 1867, 255. Ben Laoigh, at 3000 ft., *Watson.*

B. confusior A. L. Sm. On mica-schist rock. **88.** Craig Tulloch, *Cromb.* in *Grev.* iii 24. Meall-nan-Tarmachan, at 2700 ft., *Watson.*

B. episema A. L. Sm. Parasitic on the thallus of *Lecanora calcarea.* **88.** Craig Tulloch, *Smith*, 132.

B. cristata* A. L. Sm. Parasitic on the thallus of *Lecanora subcarnea.* **89. Glen Tilt, 1912. We have seen no specimens of Leighton's plant, which has only hitherto been recorded from Barmouth, in Wales. The apothecia in our plant occurred chiefly at the circumference of the thallus, which it sometimes breaks up into small scales around which the *Biatorina* clusters. The older apothecia are proliferous, occasionally in three tiers, which may have suggested the name to Leighton. The spores of our plant measure $6{\cdot}6 \times 3\,\mu$.

B. epiblastematica A. L. Sm. Parasitic on the thallus of species of *Peltigera* and on *Solorina saccata.* **88.** Glen Lyon, *Cromb.* ex *Leight.* ed. 3, 388. Creag-na-Caillich, *Smith*, 132. Near the summit of Ben Lawers, *Cromb.* in J. Bot. 1882, 275.

Bilimbia aromatica Jatta. On soil amongst calcareous rocks, and on the mortar of walls. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 352. Ben Lawers, *Smith*, 134.

Var. *hypsophila* Nyl. **88.** Ben Lawers, *Jones* ex *Cromb. Lichenes*, 78.

B. carbonacea Jatta. On calcareous rocks. **88.** Ben Lawers, *Smith*, 134.

B. squamulosa A. L. Sm. On rocks, walls, and earth. **88.** Craig Tulloch, *Smith*, 135.

B. sabulosa Massal. On earth and mosses in the crevices of rocks. **88.** Ben Lawers, *Jones* ex *Mudd*, 188. Craig Tulloch, *Cromb.* Creag-na-Caillich and Lochan-na-Chait, *Smith.* Achmore, Killin, 1913.

Var. *montana* A. L. Sm. **88.** Ben Lawers, *Smith*, 136. **89.** Ben-y-Gloe, at 2350 ft., 1912.

B. squalida Jatta. On mosses, chiefly species of *Andræa*, and on calcareous soil in alpine situations. **88.** Above Lochan-a-Chait, *Smith*, 137. Ben Lawers, at 3000 ft.

B. sphæroides Koerb. On trees. **88.** Aberfeldy, *Holl* ex *Leight.* ed. 1, 336. Ben Lawers, *Smith*, 138.

B. Nægelii* Anzi. On tree trunks. **88. On sycamore, near Crianlarich, 1910.

B. metamorphea Oliv. On mosses. Rare. **89.** Glen Fender, 1872. "Very rare, and seen only on one stone of wall," *Cromb.* in *Grev.* i. 172.

B. sabuletorum Branth. & Rostr. Encrusting mosses on rocks, walls and tree trunks. **88.** On *Weissia compacta* on Ben Lawers, 1871, *Stirt.* in *Grev.* iii. 24 (as *Lecidea subretusa* Stirt.). Killin and Craig Tulloch, *Smith*, 142. **89.** On *Tortula muralis*, on a bridge near Loch of Lows, Dunkeld, 1912.

Var. *simplicior* A. L. Sm. **88.** Ben Lawers, *Smith*, 143.

B. subviridescens* A. L. Sm. var. *trisepta* A. L. Sm. On mosses and stones. **89. On decaying *Rhacomitrium*, at 3350 ft. on Ben-y-Gloe, 1912.

B. lignaria Massal. Usually encrusting mosses on the ground, more rarely on old palings, rocks and stones. **88.** Crianlarich, Creag-na-Caillich and Ben Lawers, *Smith*, 145. On rock in wood, near Killin, south side of Loch Tay, 1912, *Hunter.* Bank of the River Dochart, Killin, 1913 (form *minuta*). **89.** Blair Atholl, *Cromb.*

Form *nigrata* A. L. Sm. **88.** Summit of Ben Lawers!, *Smith*, 145.

B. ilyophora nob. (*Lecidea ilyophora* Stirt. in Scottish Nat. 1880, 3). On decayed wood. **88.** Near Kinloch Rannoch, *Stirt.*, *loc. cit.*

B. melæna Arnold. On turfy ground and dead wood, ascending to 3000 ft. on Ben-y-Gloe. **88.** Ben Lawers!, *Jones* ex *Carroll*, J. Bot. 1867, 256. Rannoch, *Smith*, 146, near Killin. **89.** Ben-y-Gloe!, *Smith, ib.* Ben Vrackie.

B. leucoblephara* Arnold, var. *rupicola* var. nov. Thallus effuse, almost smooth, finely rimulose, very dark grey-green. Apothecia black, with a whitish sub-pubescent margin. Spores smaller, 8–13 × 3·3–4 μ. Differs from the type in the darker, non-granulose thallus and smaller spores. **87. On smooth slate rocks on the shore of Loch Ard, 1914, *A. Wilson.*

B. rhexoblephora A. L. Sm. On decaying mosses amongst schistose rocks in alpine situations. Rare. **88.** On moss, summit of Ben Lawers, 1861, *Jones* ex *Carroll* in J. Bot. 1865, 290.

B. leucophæopsis A. L. Sm. On stones in walls. **88.** Plentiful, but rare in fruit on Ben Lawers, 1872, *Cromb.* in *Grev.* i. 141.

Bacidia luteola Mudd. On trunks of trees. **88.** Aberfeldy, *Holl* ex *Leight.* ed. 1, 342.

B. inundata Koerb. On rocks and boulders which are at times under water, and occasionally on moist wood. **88.** Glen Lochay, *Smith*, 156. Boulders by the river below Killin.

B. arceutina Branth. & Rostr. On the smooth bark of trees; more rarely on old palings. **88.** Killin, Ben Lawers and Falls of Moness, Aberfeldy, *Smith*, 158.

B. Beckhausii Koerb. On trees. **88.** Aberfeldy, *Smith*, 158.

B. muscorum Mudd. Encrusting mosses. **89.** Glen Fender and Blair Atholl, *Cromb.* ex *Leight.* ed. 1, 343. Glen Tilt.

B. oribata A. L. Sm. On the ground amongst schistose rocks. **88.** Ben Lawers, 1873, *Stirt.* in *Grev.* ii. 141.

B. atrogrisea Arnold. On trunks of trees. **88.** Kenmore, *Smith*, 162.

B. umbrina Branth. & Rostr. On rocks and stones, more rarely on old palings. **88.** Ben Lawers and Craig Tulloch, *Smith*, 163. Achmore, Killin, 1913. **89.** Glen Fender, *Cromb.* ex *Leight.* ed. 1, 345.

Var. *compacta* Th. Fr. **88.** Ben Lawers, *Smith*, *ib.*

B. flavovirescens Anzi. On earth and amongst mosses on rocks. **87.** The Trossachs, 1914. **88.** Ben Lawers, *Maingay* ex *Mudd*, 186. Craig Tulloch, *Cromb.* Glen Lochay !, Killin, Creag-na-Caillich and Rannoch, *Smith*, 164. **89.** Glen Fender, *Cromb.*

Var. *alpina* A. L. Sm. **88.** Near the summit of Ben Lawers, *Smith*, 165.

Var. *arenicola* A. L. Sm. **88.** Ben Lawers, *Holl* ex *Leight.* ed. 1, 357. Creag-na-Caillich and Rannoch, *Smith*, 165.

Buellia canescens De Not. On old trees and walls. Rare. **88.** Perth, *Lindsay*, 237. Inverhaggernie, Strath Dochart, 1910.

B. polospora* A. L. Sm. On trees. **88. On birch near Loch Laidon, Rannoch Moor, 1911.

B. myriocarpa Mudd. On trees and palings, more rarely on rocks. **87.** Aberfoyle, 1914. **88.** Aberfeldy, *Cromb.* ex *Leight.* ed. 1, 307. Loch Tummel, and by the River Tummel. **89.** Blair Atholl, *Cromb.* On oak near Loch of Lows.

Var. *punctiformis* Mudd. **88.** Finlarig, Killin, 1913. **89.** Near Dunkeld (on decorticated tree branches).

B. succedens A. L. Sm. On mica-schist rocks. **88.** Ben Lawers, 1866, *Jones* ex *Carroll* in J. Bot. 1867, 258.

B. verruculosa Mudd. On rocks. **88.** Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 315.

B. leptocline Koerb. var. *Mougeotii* Th. Fr. On rocks. **88.** Craig Tulloch, *Smith*, 174.

Var. *gevrensis* Th. Fr. **89.** Cairn Gowar, 1873, *Cromb.* in *Grev.* i. 173.

B. disciformis Mudd. On trunks of trees. **87.** Glen Falloch, *Smith*, 177. Callander, *Cromb.* ex *Leight.* ed. 1. Aberfoyle.

On alder, Loch Ard. **88.** Birks of Aberfeldy and Killin, *Holl.* Glen Lochay !, *Smith*, 177. South-east side of Loch Earn, 1914. **89.** Blair Atholl, *Cromb.* ex *Leight.* ed. 1, 305.

Var. *insignis* A. L. Sm. **88.** Summit of Ben Lawers, *Smith*, 178.

B. lyperiza A. L. Sm. On smooth bark. **88.** Killin, 1874, *Stirt.* in *Grev.* iii. 35. On alders on the south side of Loch Rannoch, 1910.

B. atrata Mudd, var. *brunnea* A. L. Sm. On rocks in mountainous districts. **88.** Summit of Creag-na-Caillich, *Smith*, 179. Meall Chuirn, at 2750 ft., and above Lochan-a-Chait, Ben Lawers, at 3000 ft. **89.** Ben-y-Vrackie, at 1200 ft.

B. scabrosa Koerb. On the ground, and, more rarely, encrusting mosses on rocks. **88.** Ben Lawers, *Holl* ex *Cromb. Lichenes*, 93. Craig Tulloch and Rannoch, *Smith*, 180.

Form *athallina* A. L. Sm. **88.** Ben Lawers, *Smith*, 180.

B. alpicola Krempelh. On alpine rocks. **88.** Meall Gruaidh, *Smith*, 181

B. colludens Tuck. On schistose and quartzose mountain rocks. **88.** Killin, *Cromb.* ex *Leight.* ed. 1, 314. Ben Lawers, *Stirt.* Creag-na-Caillich, *Smith*, 182. Summit of Ben Lawers, and also lower down. **89.** Near Moulin, 1912.

B. deludens A. L. Sm. On quartzose stones in alpine situations. **89.** Summit of Cairn Gowar, 1871, *Cromb.* in *Grev.* ii. 90.

B. badioatra Koerb. On schistose alpine rocks. **88.** Ben Lawers, *Jones* ex *Mudd*, 214. Lochan-a-Chait, *Cromb. Lichenes*, 86.

Var. *atrobadia* A. L. Sm. **88.** Meall-nan-Tarmachan, 1913. **89.** Summits of Cairn Gowar and Ben-y-Gloe, 1871, *Cromb.* in *Grev.* i. 62. At 2800 ft. on Ben-y-Gloe, 1912.

B. Parmeliarum Oliv. On the thallus of various species of *Parmelia*, &c. **87.** The Trossachs, *Cromb.* **88.** On *Parmelia saxatilis* on Craigie Hill, Perth, *Lindsay*, 313. Crianlarich, *Holl.* Glen Lochay, *Smith*, 184. **89.** Craig-y-Barns, Dunkeld, *Lindsay.* Glen Shee, *Smith.*

B. advenula A. L. Sm. On the thallus of *Pertusaria Wulfenii* var. *rupicola.* **87.** The Trossachs, *Smith*, 185.

Leciographa plumbina* Anzi. On the thallus of *Coccocarpia plumbea.* **88. Finlarig woods, Killin, and near Fortingal, 1911.

L. scapanaria A. L. Sm. On hepatics. **88.** On *Jungermannia*, Ben Lawers, 1871, *Stirt.* in *Grev.* ii. 71.

Rhizocarpon Œderi Koerb. On rocks in mountain districts. **88.** Ben Lawers !, *Holl* ex *Leight.* ed. 1, 330. Loch Tummel, Glen Lochay and Killin. **89.** Blair Atholl and Ben Vrackie, *Cromb.* Glen Tilt.

R. alboatrum Th. Fr. On trees and palings. **88.** Killin, *Holl* ex *Leight.* ed. 1, 326. Finlarig, *Smith*, 189.

Var. *epipolia* A. L. Sm. **88.** Ben Lawers, *Smith*, 190. A distinct form or variety occurs at the Falls of Tummel, in which the apothecia become very prominent and tubercular, and divide into a number of small hymenia.

R. geographicum DC. On granitic, quartzose, and schistose

rocks and walls, ascending to 3900 ft., or higher, on Ben Lawers. Frequent in all three vice-counties, as also are the forms *urceolatum* and *contigua*.

Var. *atrovirens* Koerb. **88**. Amulree, *Lindsay* ex *Leight.* ed. 1, 347. Ben Chalum and Loch Laidon. **89**. Dunkeld, *Lindsay*. Ben-y-Gloe!, *Smith*, 192. Ben Vrackie, 1912.

Var. *lecanorinum* Floerke. **88**. Ben Lawers, *Lindsay* ex *Leight.* ed. 1, 346.

R. viridiatra* Koerb. On quartzose rocks. **88. Ben Chalum.

R. calcareum Th. Fr. On rocks, preferring those which are calcareous. **88**. Ben Lawers, *Jones* ex *Mudd*, 308. Craig Tulloch, *Smith*, 194. Creag-na-Caillich, at 2400 ft., 1905. **89**. Ben-y-Gloe, *Smith*, *ib.*

R. petræum Mass. (*Lecidea concentrica* Leight.). On rocks. **87**. Glen Falloch; Loch Voil; Pass of Leny, 1912. **88**. Glen Lochay, *Smith*, 194. Crianlarich, Killin, and Fearnan. South-east side of Loch Earn. **89**. Pitlochry.

Var. *excentricum* A. L. Sm. **88**. Ben Lawers, *Holl* ex *Leight.* ed. 1, 350. We found it there on the cairn at 3990 ft. in 1913. Tyndrum and Ben Chalum. Falls of Lochay.

R. confervoides DC. (*Lecidea petræa* Leight.). On rocks. Common in all three vice-counties from near sea-level up to 3500 ft. or higher on Ben Lawers.

Form *fuscescens* Leight. **87**. Glen Devon. **88**. By the River Tummel, 1912.

R. postumum Th. Fr. On alpine rocks. **87**. Ben-a-Chroin, 2700–3000 ft. **88**. Ben Lawers, *Smith*, 196. Ben Chalum, at 3300 ft., and Am Binnein, at 3820 ft.

R. obscuratum Massal. On rocks in mountain districts, ascending to 3900 ft. on Ben Lawers. **88**. Ben Lawers!, *Cromb.* ex *Leight.* ed. 3, 377. Meall Chuirn, both the type and form *ferrata* Nyl. Loch Earn, 1914.

*Var. *lavatum* Ach. **87**. Near Aberfoyle. **88**. Glen Lochay, 1913.

R. plicatile A. L. Sm. On alpine rocks. **88**. Ben Lawers, *Stirt.* ex *Leight.* ed. 3, 380.

Lopadium pezizoideum Koerb. Encrusting mosses on rocks, more rarely on earth, in alpine situations. **87**. Ben-a-Chroin, at 2800 ft. **88**. Ben Lawers, 1861, *Jones & Cromb.* ex *Cromb. Lichenes*, 75. Creag-na-Caillich, *Cromb.* Rocks above Lochan-a-Chait amongst *Andreæa*, at 2800 ft., 1913.

L. fuscoluteum Mudd. In similar situations to the preceding. **88**. Ben Lawers, *Dickson* in *Fasc.* 2, 18. Breadalbane, 1782, *Stuart*. North side of Loch Tay and Creag-na-Caillich, *Smith*, 199.

L. fecundum Th. Fr. On dead mosses amongst alpine rocks. **88**. Summit of Creag-na-Caillich, *Cromb.* in J. Bot. 1882, 275.

Lecanactaceæ.

Lecanactis Dilleniana Koerb. On subalpine rocks. **87**. The Trossachs, *Cromb. Lichenes*, 90.

Arthoniaceæ.

Arthonia didyma Koerb. On the bark of trees. **88**. Aberfeldy, *Smith*, 207.

A. gregaria Koerb. var. *kermesina* A. L. Sm. On bark. **89**. Dunkeld, *Smith*, 210.

A. excipienda Cromb. On bark. **88**. Killin, *Smith*, 212.

A. radiata Ach. On smooth bark. Frequent in all three vice-counties.

Var. *Swartziana* Sydow. **87**. On young oaks, The Trossachs, 1914. Aberfoyle, in hedges. **88**. Ben Lawers and Finlarig, *Smith*, 216. Woods near Kinloch Rannoch, 1910. Inverhaggernie, Strath Dochart. **89**. Strelitz Wood, near Cargill.

A. punctiformis Ach. On smooth bark. **88**. Glen Lochay (on hazel). **89**. Strelitz Wood, near Cargill, 1914.

Var. *melantera* Léight. **89**. Banks of the Garry, Blair Atholl, *Smith*, 217.

A. insinuata Stirt. On trees. **89**. Near Killiecrankie, *Stirt.* in Trans. Glasgow Soc. Nat. 1875, 90.

A. lapidicola Branth. & Rostr. On calcareous rocks. **88**. Near summit of Ben Lawers, *Jones & Carroll* ex *Carroll* in J. Bot. 1866, 24. Ben Lawers, at 3200 ft., 1911.

Graphidaceæ.

Lithographa tesserata Nyl. On rocks in mountain districts. Rare. **88**. Ben Lawers, *Cromb. Lichenes*, 95. **89**. Summit of Cairn Gower, *Cromb.* in *Grev.* i. 170.

Xylographa parallela Fr. On old fir palings. **87**. Glen Falloch, *Holl* ex *Cromb. Lichenes*, 95. **88**. Ben Lawers and Glen Lochay, *Cromb.* **89**. Pass of Killiecrankie, *Cromb.* in *Grev.* i. 170. Glen Fender, *Smith*, 224.

Var. *pallens* Nyl. **88**. Achmore, Glen Lochay and Killin, *Smith, ib.* **89**. Blair Atholl and Pass of Killiecrankie, *Cromb.* ex *Leight.* ed. 3, 391.

Form *elliptica* Nyl. **88**. Achmore, Killin; Ben Lawers, *Smith*, 224. **89**. Pass of Killiecrankie, *Cromb.* ex *Leight.* ed. 3, 391.

X. laricicola Nyl. On the bark of larch trees. **88**. On a single tree near its base in Lawers Glen, 1874, *Cromb.* in *Grev.* iii. 128. "It probably derives its greatest interest from being a purely corticole species, growing on the bark of *living* trees, a habitat hitherto unknown for any Xylographa."

Ptychographa xylographoides Nyl. **88**. On decorticated mountain ash on Creag-na-Caillich, *Cromb.* in J. Bot. 1874, 257.

Melaspilea lentiginosula A. L. Sm. On trees. **87**. On old pines, Glen Falloch, 1864, *Carroll* in J. Bot. 1866, 24. **88**. Black Wood of Rannoch, *Smith*, 227.

Opegrapha herpetica Ach. On trees. **89**. Dunkeld, *Smith*, 230.

*Var. *subocellata* Ach. **89**. Near Blair Atholl, 1908.

O. atra Pers. On trees. Frequent. **87**. Callander, *Cromb.* ex *Leight.* ed. 1, 375. Aberfoyle, 1914. **88**. Finlarig Wood. Glen Dochart. **89**. Blair Atholl, *Cromb. loc. cit.* Pitlochry and Dunkeld.

*Var. *denigrata* Schaer. **89**. Near Cargill, 1914.

O. betulina Sm. On trees, and occasionally on palings. **88**. Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 401. **89**. Blair Atholl, *Cromb.* ex *Leight.* ed. 1, 378. Pitlochry.

O. saxicola Ach. var. *Persoonii* Stiz. On rocks. **88**. Craig Tulloch, *Smith*, 235.

O. confluens Stiz. On rocks, chiefly siliceous. **88**. Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 401.

O. varia Pers. form *pulicaris* Leight. On trees. **87**. Aberfoyle, 1914. **88**. Killin! *Cromb.* ex *Leight.* ed. 1, 381. Near Kenmore, 1913. **89**. Blair Atholl, *Smith*, 240.

Form *diaphora* A. L. Sm. **88**. Killin! *Cromb.* ex *Leight.* ed. 1, 381. Finlarig Wood.

*Var. *notha* Fr. **88**. Near Kenmore, 1913.

Var. *rimalis* Fr. **88**. Craig Tulloch, *Smith*, 240. **89**. Blair Atholl, *Cromb.* ex *Leight.* ed. 1, 383.

O. vulgata Ach. On trees. **87**. Callander, *Smith*, 241. The Trossachs. **88**. Killin, *Cromb.* ex *Leight.* ed. 1, 384. Glen Lochay and Finlarig, 1913. **89**. Dunkeld.

Var. *siderella* Nyl. **88**. Kenmore, *Smith*, 242. Finlarig Woods, 1911.

O. zonata* Koerb. On damp shady rocks. **88. Falls of Tummel, 1912.

Graphis elegans Ach. On trees. Frequent. **87**. The Trossachs, 1912. Near Aberfoyle. On oak, Loch Ard, 1914. **88**. Finlarig. South-east side of Loch Earn. **89**. Glen Tilt! *Smith*, 247. Black Spout, Pitlochry.

Form *parallela* Leight. **87**. The Trossachs. **89**. Glen Tilt, *Smith*, 247.

*Var. *catenula* Malb. **87**. The Trossachs, 1912.

G. scripta Ach. On trees. **87**. Near Aberfoyle. **88**. Aberfeldy, *Smith*, 249. Glen Lochay. **89**. Black Spout, Pitlochry, 1912. Dunkeld.

Var. *minuta* Mudd. **87**. Callander, *Cromb.* ex *Leight.* ed. 1, 363.

*Var. *varia* Arnell. **87**. On holly, The Trossachs, 1912.

*Var. *pulverulenta* Ach. **87**. The Trossachs, 1912.

Phæographis inusta* Muell-Arg. var. *macularis* A. L. Sm. **89. On Ash, Cluny Bridge, Pitlochry, 1912.

Graphina anguina Muell-Arg. (*Graphis sophistica* Nyl.). **88**. On trees on the south-east side of Loch Earn, 1914.

Var. *pulverulenta* A. L. Sm. **88**. Loch Tay Woods, *Greville* ex *Leight.* ed. 1, 371. South-east side of Loch Earn, 1914.

Pyrenidaceæ.

Coriscium viride A. Zahlbr. On turfy soil. **87**. Ben Ledi, *Smith*, 265. **88**. Ben Lawers! *Maingay* ex *Mudd*, 269. Rannoch, *Stirt.* in Scottish Nat. 1880, 1. Ben Lawers, at 3500 ft., *Watson*. Near Lochan-a-Chait, at 2800 ft.

Lophothelium acervatum Stirt. On turfy soil. **88**. Ben Lawers, *Stirt.* in Scottish Nat. 1887, 265.

Obryzum dolichoteron Nyl. Parasitic on species of *Collema*.

88. On *Collema melænum*, Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 497.

Pyreniococcus, gen. nov. Thallus none. Perithecia simple, coloured, subimmersed in the tissues of a host-plant containing gonimia (*Cyanophyceæ*), opening by a pore. Spores 8 in the ascus, ellipsoid, septate, fuscous. Allied to *Obryzum*, from which it differs chiefly in the shape and colour of the spores.

P. exoriens* nobis (*Endococcus exoriens* Stirt. in Scottish Nat. 1880, 4). Thallus none proper. Perithecia in the thallus of *Pannariæ*, semi-immersed, small, fuscous to fuscous-black; paraphyses none. Spores 8, ellipsoid, 3-septate, fuscous, 0·009–0·011 mm. long, 0·006 mm. thick; hymenial gelatine wine-red with iodine. **88. On the thallus of a *Pannaria*, probably *P. brunnea*, Craig Var near Kinloch-Rannoch, *Stirt. loc. cit.*

Dermatocarpaceæ.

Dermatocarpon miniatum Th. Fr. On dry rocks, preferring those that are calcareous, generally in shade. **88**. Ben Lawers. *Phytol.* 1843. Kenmore and Glen Lochay, *Smith*, 267. Finlarig Wood, 1911. **89**. Crag on south face of Kinnoull Hill, *Lindsay*, 291. Dunkeld, *Smith, ib.*

Var. *leptophyllum* Dalla Torre & Sarnth. **88**. Lochan-a-Chait, *Smith, ib.* **89**. Kinnoull Hill, *Borrer & Hook.* in *Hook.* 44.

Var. *complicatum* Th. Fr. **88**. Kenmore and Ben Lawers, *Smith*, 268. Glen Lochay, *Cromb.* ex *Leight.* ed. 1, 410. **89**. Kinnoull Hill, *Smith, ib.*

Form *decipiens* A. L. Sm. **88**. South side of Loch Tay, *Smith, ib.*

D. aquaticum A. Zahlbr. On rocks and stones in streams and on the margins of lakes. **88**. Ben Lawers, *Hooker* ex *Leight.* ed. 1, 141. Loch Tay, Loch Dochart and Loch Tummel, *Smith*, 269. Near Fearnan. Loch Earn, 1914.

D. lachneum A. L. Sm. On earth amongst calcareous rocks. **88**. Ben Lawers! *Maingay* ex *Mudd*, 267. Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 412. Creag-na-Caillich, *Smith*, 270. **89**. Kinnoull Hill, *Hooker & Borrer* ex *Leight.* ed. 1, 412.

D. hepaticum Th. Fr. On earth and old walls, ascending to 3940 ft. on Ben Lawers. **88**. Glen Lochay, Killin, *Cromb. Lichenes*, 108. Ben Lawers! *Smith*, 271. King's Seat, *Watson.*

D. cinereum Th. Fr. In similar situations to the preceding, ascending to 3900 ft., or higher on Ben Lawers. **88**. Summit of Ben Lawers! *Borrer* ex *Leight. British Species of Angiocarpous Lichens*, 1851, 22. Finlarig, *Smith*, 271.

Var. *cartilagineum* A. L. Sm. **88**. Summit of Ben Lawers, *Carroll* in J. Bot. 1866, 24. Creag-na-Caillich, *Smith*, 272.

Normandina pulchella Cromb. On mossy tree trunks. **87**. The Trossachs and Glen Falloch, *Smith*, 273. **88**. Killin, *Cromb. Lichenes*, 107. Finlarig and Glen Lochay, *Smith, ib.*

Dacampia Hookeri Massal. On earth amongst alpine rocks. **88**. Plentiful on the summit of Ben Lawers, 1808, *Hooker & Borrer* ex *Leight. British Species of Angiocarpous Lichens*, 1851, 64

and 77. Still on Ben Lawers, in the west corrie, at 3900 ft. 1913.

Verrucariaceæ.

Verrucaria lævata Ach. On rocks and stones, usually in streams. **88**. Ben Lawers, *Smith*, 281.

V. margacea Wahlenb. On moist rocks in and on the margins of streams. **88**. Craig Tulloch and Ben Lawers, *Smith*, 281. **89**. Glen Tilt, *Cromb.* ex *Leight.* ed. 1, 416.

V. æthiobola* Wahl. In similar situations to the preceding. **88. On stones in stream near Rannoch Station, 1910. Glen Lochay.

*Var. *acrotella* A. L. Sm. **88**. Shore of Loch Tummel, 1912.

V. viridula Ach. On rocks and walls. **89**. Spital of Glen Shee, *Lindsay* ex *Leight.* ed. 1, 424.

V. macrostoma DC. In similar situations to the above. **88**. Craig Tulloch, *Cromb.* ex *Leight. ib.*

V. nigrescens Pers. On calcareous rocks, walls and stones. **88**. Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 421. Ben Lawers, *Smith*, 286. **89**. Killiecrankie, 1912.

V. mauroides* Schaer. On calcareous rocks and stones. **88. Achmore, Killin, 1913.

V. cærulea DC. (= *V. plumbea* Ach.). On limestone rocks. **88**. Craig Tulloch, *Smith*, 288.

V. muralis* Ach. On the mortar of walls, &c. **88. Near Killin. **89**. Mortar of bridge between Dunkeld and Loch of Lows, 1912.

V. integra Carroll. On limestone rocks and walls. **88**. Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 457.

V. calciseda DC. On limestone rocks and walls. **88**. Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 458.

Thelidium pyrenophorum Koerb. On calcareous and schistose rocks in mountain districts, ascending to the cairn on Ben Lawers (3990 ft.). **88**. Ben Lawers! *Jones* ex *Mudd*, 296. Craig Tulloch, *Cromb.*

T. explicatum nobis (*Verrucaria explicata* Stirt. in Scottish Nat. 1880, 4). In similar situations to the preceding. **88**. Near the summit of Ben Lawers, *Stirt. loc. cit.*

T. papulare Arn. On rocks in mountain districts. **88**. Creag-na-Caillich, *Maingay* ex *Mudd*, 295.

T. superpositum A. L. Sm. Parasitic on *Polyblastia theleodes*. **88**. Summit of Ben Lawers, 1865, *Jones & Carroll* in J. Bot. 1866, 25.

Polyblastia intercedens Loennr. On schistose and calcareous rocks. **88**. Ben Lawers, 1864, *Jones & Carroll* in J. Bot. 1865, 292. Still there at 3350 ft. in 1913.

P. fuscoargillacea Anzi. On rocks. **88**. Craig Tulloch, *Cromb.* ex *Leight.* ed. 1, 455. Ben Lawers, at 3350 ft., 1913. **89**. Base of Ben-y-Gloe, 1870, *Cromb.*

P. inumbrata A. L. Sm. On schistose rocks. **88**. Ben Lawers, 1864, *Jones* ex *Carroll* in J. Bot. 1865, 292. Creag-an-Lochan, at 2200 ft., *Watson*.

P. Sendtneri Krempelh. On mossy earth in alpine situations. **88**. Summit of Ben Lawers, *Jones & Carroll, loc. cit.*

P. gelatinosa Th. Fr. In similar situations to the preceding. **87.** Summit of Ben-a-Chroin, 3050 ft., 1913. **88.** Summit of Ben Lawers, 1860; *Jones* ex *Mudd*, 282.

P. theleodes Th. Fr. On rocks in mountain districts. **88.** Summit of Ben Lawers, 1860, *Jones* ex *Mudd*, 282. Craig Tulloch, *Cromb.* Creag-an-Lochan, *Watson.* Lochan-a-Chait.

P. scotinospora Hellb. On schistose rocks on mountains. **88.** Head of Lochan-a-Chait, Ben Lawers, 1860, *Jones* ex *Mudd*, 282. Summit of Craig-na-Caillich, *Maingay*, *ib.* Glen Lochay, 1913.

P. Henscheliana Loennr. On schistose rocks. **88.** Ben Lawers, *Jones & Carroll* ex *Carroll*, J. Bot. 1865, 292. Craig Tulloch, *Cromb.* ex *Leight.* ed. 3, 489.

P. nigritella A. L. Sm. On peaty earth between the squamules of *Dermatocarpon cinereum.* **88.** Ben Lawers, 1864, *Carroll* in J. Bot. 1866, 25.

P. peltophora A. L. Sm. On earth. **88.** Ben Lawers, *Stirt.* in *Grev.* iii. 1874, 37.

P. addubitans nobis (*Verrucaria addubitans*, *Stirt.* in Scottish Nat. 1880, 4). On decorticated wood. **88.** Near Kinloch-Rannoch, *Stirt. loc. cit.*

Microglæna corrosa Arn. On alpine rocks. **87.** South side of Am Binnein, at 3500 ft., 1913. Ben-a-Chroin, at 2700 ft. It is possible that these may belong to the following variety.

Var. *nericiensis* A. L. Sm. **88.** Ben Lawers, *Holl* ex *Smith*, 309.

***M. breadalbanensis,** sp. nov. Thallus pale citrine-yellow, smooth, broken into scattered or more contiguous subangular fragments, each bearing one or rarely two apothecia. Perithecia small, subglobose, slightly immersed at the base, black; exothecium thick, black, gradually thinner towards the base, where it forms a very thin brown line; ostiole poriform, sometimes slightly protuberant, but hardly papillæform. Asci and paraphyses as in the genus. Spores 6 to 8, irregularly biseriate, colourless, 0·018–20 mm. long, 0·010 mm. thick, elliptic-oblong, obtuse at one or both ends, the muriform divisions usually in six or seven transverse rows; longitudinal dissepiments 1–3.

On mica-schist rocks, scattered in very small or rather larger and subcircular patches amongst *Lecidea contigua.* The largest example seen was nearly circular and about 9 millimetres in diameter, but some of the specimens consisted of scattered groups about 2 mm. across. **88.** Ben Cruichben, near Killin, at 3100 ft., June, 1913, *A. Wilson.*

Staurothele hymenogonia A. Zahlbr. On calcareous rocks. **88.** Ben Lawers, *Smith*, 311.

S. umbrinum A. L. Sm. On rocks. **88.** Ben Lawers, *Jones* ex *Mudd*, 281. Craig Tulloch, *Cromb.* **89.** Ben-y-Gloe, *Cromb.*

Pyrenulaceæ.

Acrocordia gemmata Koerb. On trunks of trees. **88.** Aberfeldy, *Smith*, 314. Finlarig Woods, Killin, Glen Dochart. **89.** On

sycamore, near Loch of Butterston, Dunkeld. On oak, near Pitlochry, 1912.

A. biformis* Oliv. On trunks of trees. **88. Finlarig, Killin. **89.** Near Pitlochry, 1912, a form approaching var. *conformis* in the often biguttulate cells of the spores which, however, are as frequently normal in this respect, and in size. Dunkeld.

*Var. *conformis* A. L. Sm. **88.** Achmore, Killin, *Watson.* Glen Lochay.

Arthopyrenia epidermidis* Mudd. On trees. **87. On young oaks, The Trossachs. **88.** On hazel, Glen Dochart, near Killin, 1913. **89.** Near Pitlochry.

A. punctiformis* Arn. On trees. **88. Shore of Loch Tay, near Fearnan, 1911. Glen Lochay and Achmore, Killin. **89.** Near Pitlochry.

A. pyrenastrella* Oliv. On bark. **88. Shore of Loch Tay, near Fearnan, 1911.

A. cinerioprunosa* Koerb. On bark. **89. On ash, Cluny Bridge, Pitlochry, 1912.

A. fallax* Arn. On smooth bark. **88. Inverhaggernie, near Crianlarich. Glen Lochay and Achmore, Killin. **89.** On oak twigs, near Pitlochry, 1912.

A. Laburni Sydow. On trees. **88.** Aberfeldy, *Smith,* 322.

A. spilobola A. L. Sm. On rocks and stones. **88.** Craig Tulloch, 1872, *Cromb.* ex *Leight.* ed. 3, 469. **89.** On stones, King's Seat, Sidlaw Hills. The spores become septate at maturity. When younger it might be mistaken for a *Verrucaria,* but the gonidia (*Trentepohlia*) then distinguish it.

A. bryospila A. L. Sm. On mosses and schistose soil. **88.** Ben Lawers, 1864, *Carroll* in J. Bot. 1865, 293.

A. allogena A. L. Sm. Parasitic on the thallus of *Rhizocarpon petræum* var. *excentricum,* &c. **88.** Near the summit of Ben Lawers, 1864, *Carroll* in J. Bot. 1866, 25. Ben Laoigh, at 2500 ft., 1911.

A. colleta A. L. Sm. On *Gymnomitrium concinnatum.* **88.** On Ben Lawers, *Stirt.* in *Grev.* iii. 37.

A. rhyponta Massal. On the bark of trees. **88.** Killin, *Smith,* ii. 328. **88** or **89**? By the Garry, *Cromb.* in *Grev.* i. 170. (Right or left bank of river not stated.)

A. Crombei A. L. Sm. On bark. **88** or **89**? Banks of the Garry, *Smith,* 328.

Leptorhaphis epidermidis Th. Fr. On the bark of birches. **87.** Glen Falloch, *Smith,* 330. The Trossachs. **88.** Bank of the Tummel. **89.** Near Pitlochry.

Microthelia exerrans A. L. Sm. On quartzose stones. **89.** Ben-y-Gloe, 1877, *Cromb.* in *Grev.* viii. 114.

Porina lectissima* A. Zahlbr. On damp rocks. **88. Glen Lochay, 1913.

P. furvescens A. L. Sm. On mosses on the ground. **88.** Summit of Ben Lawers, 1864, *Jones & Carroll* in J. Bot. 1865, 293.

P. carpinea* A. Zahlbr. On smooth branches of trees. **88. Sparingly in Glen Lochay, 1913.

Thelopsis rubella Nyl. On bark. **87**. Lanrick Castle, near Doune, 1866, *McKinley* ex *Leight*. ed. 1. 443.

Th. melathelia Nyl. Encrusting mosses on mountains. **88**. Summit of Ben Lawers, 1864, *Jones* ex *Carroll*, J. Bot. 1865, 293. Creag-na-Caillich, *Cromb. Lichenes*, 123.

Pyrenula nitida Ach. On the bark of trees. **87**. Glen Falloch, *Smith*, 341. **89**. On oak, near Pitlochry, 1912.

*Var. *nitidella* Mudd. **88**. Achmore, Killin, *Watson*, 1913.

Trypetheliaceæ.

Melanotheca gelatinosa Nyl. On smooth bark of trees. **88**. Glen Lochay, *Cromb.* ex *Leight*. ed. 1, 467. By the Garry, *Cromb.* in *Grev*. i. 170. Killin, *Smith*, 348. By Loch Tay, near Fearnan, 1911. **89**. Blair Atholl, *Smith, ib.*

Mycoporaceæ.

Mycoporum miserrimum* Nyl. On smooth bark. **88. On hazel, Glen Lochay, 1913.

Incertæ Sedis.

Botrydina vulgaris* Bréb. **88. Killin, *Watson*, 1913.

Sirosiphon ocellatus*, Kütz. **88. Tyndrum, *Watson*, 1913.

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R.A. Salisbury del.
F. Bagley lith.

West, Newman imp.

Narcissus poeticus L.

NARCISSUS POETICUS AND ITS ALLIES.

By H. W. PUGSLEY, B.A.

The cultivation of Daffodils, which has lately become one of the most fashionable of horticultural pursuits in this country, was followed with zest more than three hundred years ago, when Gerard described and figured a large number of forms in his *Herbal*. The infinite variety of the Narcissus lends it indeed the pre-eminent place among the flowers of spring which in summer belongs to the Rose; and the extreme beauty of some recent garden-hybrids, such as the trumpet variety "Madame de Graaf," to say nothing of still later creations like "Peter Barr," bears eloquent testimony to the success of modern cultivators, while a glance at the *poeticus* form "Cassandra" at once explains how the classical legend of the son of Cephissus arose among the Bœotian Greeks.

But while present-day gardeners have striven with energy to improve the Narcissus, very little botanical work on the genus has appeared since the publication of Mr. J. G. Baker's *Amaryllideæ* in 1888, and the inadequate and unequal treatment of these plants in such an important modern work as Rouy's *Flore de France* is at once seen on comparing his account of *Narcissus poeticus* with that of the species of a genus like *Viola*.

The botanical investigation of Narcissi presents two principal difficulties. In the first place, a number of garden forms exist or have existed concerning whose origin there is some uncertainty. While they may be truly wild plants, it is quite possible that they are ancient hybrids, for it is certain that Narcissi have been cultivated in some part of Europe during many centuries. A second difficulty, which applies especially to the Poet's forms, arises from the obliteration of the floral characters in dried specimens. In these all traces of colouring generally vanish after a few years, and it is often impossible to determine the curving of the perianth-segments and risky even to define the shape of the corona; moreover, many exsiccata are mere scraps—flowers without bulb, foliage, or fruit. Fortunately, in some cases, published figures are in existence which are accurate and reliable, but many plates, and notably those in recent works, leave much to be desired.

On the other hand, the examination of Narcissi is facilitated

by the comparative ease generally attending their cultivation (although the difference of behaviour of apparently closely allied forms under similar conditions is sometimes surprising), and wild plants do not readily become abnormal. My knowledge of living Daffodils, such as it is, is largely derived from growing during the past twenty years the greatest possible variety in the borders and grass-plot of a small suburban garden on the London Clay; and my interest in the forms of *N. poeticus* has been stimulated by the occasional introduction of wild bulbs collected during holidays in the Swiss and Italian Alps. These wild bulbs, however, have usually failed to maintain themselves in my heavy soil, with the exception of some gathered in the Saas Valley, in Switzerland, at an altitude of about 6000 ft., in July, 1909, when the flowering was past and the foliage withering. These first bloomed in 1911, and unexpectedly proved to be the Pheasant's Eye Narcissus (*N. recurvus*), matching exactly the common form of English gardens. The bulbs were taken from a hilly, alpine meadow—not far, it is true, from some summer chalets, but several miles distant from the nearest gardens. It is difficult to understand how they could have been introduced in this situation, and as no flowers were visible at the time of collecting, the extent of the habitat could not readily be seen. In 1913, I drew the attention of M. Beauverd, of the Boissier Herbarium near Geneva, to this occurrence of *N. recurvus*, and learned from him that it also grew in another locality in the Valais, at about the same altitude, where he had previously supposed it to be an introduction, but now, after enquiries, thinks it may be indigenous. But M. Beauverd has also suggested that the plant may have sprung from seeds of flowers left to fade in the bouquets placed by the peasants in the oratories in the neighbourhood of his locality. This solution seemed to me impossible, owing to the slow development of the fruit and seed of Narcissi, until I found in 1914, by leaving bunches of wild specimens from Glion and Savoy in water for some weeks, that not only fruits but even a few seeds were actually produced. M. Beauverd's suggestion may thus be a sound one if *N. recurvus* is a fertile plant. In the garden I get no seed from it, and the Rev. G. H. Engleheart informs me that it is usually a sparing and irregular seeder, both naturally and when cross-fertilised—which may be taken as evidence of hybrid origin. But the plant may develop differently in the Alps, whether wild there or not. Its strongly marked features do not point to hybridity and can hardly be considered intermediate between those of any of the older known *poeticus* forms; judging from the recurving leaves and arcuately reflexed perianth, it would appear to be one of the parents of such garden-hybrids as *N. Leedsii* "M. M. de Graaf." As a natural species, however, its remarkable uniformity, as seen in cultivation, is in strong contrast with the variability of some other wild forms.

The consideration of the status of *N. recurvus* involves a survey of the other forms of Poet's Narcissi, and as the literature of the subject is extensive, it is proposed to give an outline of the views

of the chief British and Continental authors who have paid attention to them.

At the outset it may be well to recall that *N. poeticus* is commonly represented in English gardens of the present day by two distinct plants. One of these, sold as *N. ornatus*, flowers naturally in April and is obtained much earlier by forcing. It has erect and narrow leaves, broadly obovate perianth-segments, imbricated above, and an almost flat or discoid corona. The other form, the Pheasant's Eye (*N. recurvus*), never flowers before May, and is distinguished by its recurved and much larger leaves, a symmetrically recurved perianth, with oval segments laterally inflexed, and a distinctly though shortly cup-shaped corona. These two plants have the facies of two distinct species.

In British botany four forms of single-flowered Poet's Narcissi were described and figured as early as 1597 in Gerard's *Herbal*, p. 108, *viz.*:—

1. *N. medio purpureus.* "Purple circled Daffodill." Stated to bear in the middle of the flower a small yellow coronet with a purple circle, and clearly figured as a large-flowered plant with ovate-oblong, imbricate and recurved perianth-segments.

2. *N. medio purpureus præcox.* "Timely purple ringed Daffodill." Stated to be a somewhat lesser plant, and figured with smaller stellate flowers.

3. *N. medio purpureus præcocior.* Distinguished by broad, flat leaves bending over at the tip, and figured with small stellate flowers; still earlier flowering.

4. *N. medio purpureus præcocissimus.* The smallest plant and first to flower; figured with stellate flowers.

According to Gerard, No. 1 flowers in April and the other three in February (Old Style Calendar).

Of these four plants one only appears as a species in Johnson's *Gerard*, p. 123 (1633), where it is described under Gerard's name of *N. medio purpureus*, with a fresh figure copied from Dodonæus's *Pemptades*. Gerard's four figures are discarded, and his remaining forms are only briefly alluded to.

Meanwhile, a second elaborate account of the Poet's Narcissi had been printed in Parkinson's *Paradisus*, pp. 74–76 (1629), where, besides double-flowering plants and *N. medio luteus vulgaris* (Primrose Peerless), the author describes five forms. These are:—

1. *N. mediocroceus serotinus.* A form with narrow leaves and stellate flowers, with small round saffron-edged cup.

2. *N. medio purpureus præcox* (p. 75, f. 3). Said to be very sweet scented, with a flat yellow cup, bordered with red or purple; and shown in the figure with waved, obovate, slightly imbricate perianth-segments.

3. *N. medio purpureus serotinus.* Described as having a larger bulb, broad leaves, large flowers with imbricate segments, and the edge of the corona sometimes paler red.

4. *N. medio purpureus maximus* (p. 75, f. 2). Stated to be still larger in all its parts, and figured with broadly oval,

imbricate perianth-segments, and a cupped corona with seemingly a fimbriate margin.

5. *N. medio purpureus stellaris* (p. 75, f. 4). Said to have narrower and greener leaves, and a less scented flower with a yellow, purple-edged corona. The figure shows narrow and distant perianth-segments.

Parkinson adds that the first of these flowers in May, the second early in March, and the remaining three in April, about a month later (Old Style). The bulbs of 2, 4, and 5 are supposed to have been brought from Constantinople, and 3 from Germany, France, and Italy. Gerard is not quoted by Parkinson.

These Narcissi are reduced to four species by Ray (Hist. ii. p. 1133 (1688)), who does not appear, however, to have been well acquainted with them. His first species is *N. medio purpureus* of J. Bauhin and Gerard, and for this he cites Parkinson's *N. medio purpureus serotinus* and C. Bauhin's *N. albus circulo purpureo* as synonyms. The description is taken from J. Bauhin's *Historia*, and the plant is said to grow in Narbonne and Italy. Parkinson's *N. medio purpureus præcox* and perhaps *N. m. p. maximus* are included under it.

Ray's remaining species are :—

2. *N. medio croceus serotinus* Park., with small leaves and stellate flowers.

3. *N. medio purpureus magno flore latiore* (*N. latifolius* vii. Clus.; *N. medio purpureus maximus* Park.?), a late flowering form said to grow in Styria, and probably taken from Clusius's History.

4. *N. niveus odoratus circulo rubello* C. Bauhin (*N. latifolius* vi. Clus.; *N. medio purpureus stellaris* Park.), a plant with narrow leaves, stellate flowers, and small corona, evidently copied from Clusius, and said to be abundant above Gaming, in Lower Austria.

It will be noticed that two of these species said by Parkinson to come from Constantinople are referred by Ray to Austrian habitats.

After the time of Ray the characters of these plants were lost sight of in Britain : one single-flowered form only is mentioned in Miller's *Gardener's Dictionary*, ed. 1 (1731), Gerard and Parkinson not even being quoted. In the eighth edition (1768), after Linnæus's description of *N. poeticus* in *Species Plantarum*, this form reappears under that name with *N. albus circulo purpureo* Bauhin as a synonym, and the only addition is *N. albus* Miller, a little-known plant possibly related to *N. triandrus*.

In 1793 a redivision of *N. poeticus* into three species was proposed by Curtis (*Botanical Magazine*, No. 193), one of which was figured as *N. angustifolius*. Curtis writes that under the name of *N. poeticus* three different species, to us appearing perfectly distinct, and regarded as such by the old botanists, have been confounded by the moderns, *viz.* :—

1. *Narcissus medio purpureus præcox*, Park. Par. (*N. albus circulo purpureo*, C. Bauhin).

2. *Narcissus medio purpureus serotinus*, Park. Par. (*N. albus magno odore flore circulo pallido*, C. Bauh.).

3. *Narcissus medio luteus vulgaris*, Park. Par. (*N. pallidus circulo luteo*, C. Bauh.).

"The two former of these have the greatest affinity . . . having a very short nectary edged with orange . . . since the name *poeticus* is equally suitable to both . . . we have thought best to get rid of it altogether, and to substitute for 1, *angustifolius*; for 2, *majalis*; for 3, *biflorus*."

"The *angustifolius* here figured is a native of the South of Europe and said by Magnol and Clusius to grow spontaneously in the meadows about Narbonne and Montpelier. It flowers in our gardens early in April, about a month before the *biflorus*, and full six weeks sooner than the *majalis*."

No diagnosis of *N. angustifolius* is furnished, but there is a full synonymy cited from pre-Linnean authors. The plate is a fairly good one, depicting a plant with narrow leaves, and a flower with narrowly obovate, spreading perianth-segments, and seemingly a small, cupped corona margined with deep red and with all the stamens exserted.

Of *N. majalis* Curtis gives no account; the name is based solely on the references to Parkinson and Bauhin. *N. biflorus* is the well-known plant—not a true Poet's Narcissus—which Curtis subsequently described and figured.

Soon after Curtis's publication, *N. angustifolius* and *N. majalis* were described under fresh names by Richard A. Salisbury (*Prodromus Stirp. Hort. Chapel Allerton*, p. 225 (1796)), as follows:—

"N. RADIIFLORUS. Germine pyriformi; corollæ laciniis incurvulo-horizontalibus, obovatis, interioribus vix imbricatis; coronâ acetabuliformi, scarioso-crenulatâ; antheris omnibus extra tubum.

"*N. angustifolius* Curt. Bot. Mag. 193, cum ic.; *N. poeticus* Linn. Herb. et Sp. Pl. ed. 2, p. 414.

"N. PATELLARIS. Germine ovali; corollæ laciniis recurvulo-horizontalibus, obovatis, interioribus imbricatis; coronâ cotyliformi, scarioso-crenulatâ; antheris tribus intra tubum.

"*N. majalis* Curt. Bot. Mag. sub 193; *N. latifolius* vii. Clusius, Hist. Pl. lib. 2, p. 157.

"Germen in hoc prægrande."

Some years later (Trans. Hort. Soc. i. 365 (1812)) Salisbury subdivided *N. radiiflorus* into two species, but furnished no further diagnoses. The original name, with *N. angustifolius* Curt. and *N. medio purpureus stellaris* Park. as synonyms, is retained for a plant said to grow in Swiss subalpine meadows, and to flower in English gardens early in April. No reasons are offered for thus identifying a Swiss subalpine plant with the earliest flowering garden form known in Britain. The second species is named *N. poeticus* MSS. (*N. medio pupureus præcox* Park.), and is stated to be the true Narcissus of the poets and to flower immediately after *N. radiiflorus*. Salisbury mentions that he had wild roots of this plant sent by Broussonet from Montpelier, in S. France. The MS. of this paper is preserved in Herb. Mus. Brit., together

with an unpublished continuation which deals further with *N. patellaris*. Of this, *N. poeticus* Smith in E. B. 275, *N. majalis* Curt., *N. poeticus* L. Sp. Pl. auctoritate ejus speciminis, and *N. medio purpureus serotinus* Park. are cited by Salisbury as synonyms, and the plant is said to grow wild in the alps of Styria and Kartschia, flowering long after the others, never till June in its natural habitats. There are thus three species of Poet's Narcissi in Salisbury's later arrangement, and it will be observed that the Linnean specimen is now identified with *N. patellaris* instead of *N. radiiflorus*, as in the *Prodromus*.

The British Museum Herbarium contains, in addition to his manuscripts, a fine set of original drawings of various Narcissi executed by Salisbury at various periods and labelled in his handwriting. These include (1) *tripodalis* (= *poeticus* MS.), showing flowers with obovate outer segments and narrower, oblong, inner ones, all contiguous, and a flat corona with only three stamens exserted; (2) *radiiflorus* (not legibly labelled), having flowers with narrowly obovate, distant segments, and very small, cupular corona, with unequal stamens, all exserted, and the longer exceeding the corona; (3) *patellaris*, with oval, imbricated perianth-segments, large, cupular, fimbriate corona, and unequal stamens; and (4) *curvilobus* MS. (= *recurvus* Haworth), the common Pheasant's Eye of present-day gardens.

N. poeticus had meanwhile appeared as a naturalized British plant in *English Botany*, No. 275 (1795), where Smith cites *N. majalis* Curt. in synonymy and adds that the Linnean Herbarium confirms that his plant is the true species of Linnæus. The brief description mentions that the leaves are more than half an inch broad and the nectary bordered with orange or rather crimson; and the plate was drawn from a specimen collected on May 26th, 1795, near Gravesend, which is preserved in Herb. Mus. Brit. and undoubtedly represents the *N. patellaris* of Salisbury. The corona of the flower, as drawn, is markedly cupular, with a crimson and peculiarly fringed margin, beneath which is a broad white zone extending almost half-way to the base of the cup. In May, 1914, I had the satisfaction of finding this plant still flourishing in an old garden in North Kent.

We now come to the work of Adrian Hardy Haworth, whose knowledge of cultivated Narcissi has rarely been equalled till quite recent years and whose descriptions are among the most complete and accurate that we possess. His first publication on *Narcissus* was a classified list printed in Trans. Linn. Soc. i. 244 (1800), in which *N. poeticus* and *N. angustifolius* are included as distinct species, the figure of *English Botany* being cited for the former and Curtis's plate for the latter. Haworth next described (Syn. Pl. Succ. Appendix, p. 331 (1812)) as a new species, under the name of *N. recurvus*, the Drooping-leaved Narcissus, the plant now known as the Pheasant's Eye, which seems to have previously been unnoticed. His diagnosis runs:—"N. foliis semuncialibus glaucis superne debiliter recurvo-dependentibus; petalis imbricatis lateribus inflexis; nectario patellari perplicato, margine crenulato

coccineo; stigmate longitudine staminum interiorum." This new plant is distinguished from *N. radiiflorus* Salisb., not only by its flowers but by its more glaucous, less keeled and much broader leaves. *N. poeticus*, then but recently separated by Salisbury in Hort. Trans. i. p. 365, is said to differ abundantly in foliage, corolla and earlier flowering, and in its far more flattened and different nectary. *N. patellaris* Salisb. is stated to be a smaller and rather earlier flowering plant than *N. recurvus* and is described, "N. foliis 4-linearibus glaucis subincurvantibus, petalis imbricatis lateribus deflexis; nectario patellari luteo minutissime plicatulo, margine subscarioso circulo albo gracili externe coccineo crenulato; stigmate longitudine staminum interiorum." It will be observed that in breadth of foliage and colouring of corona this plant does not agree with that of *English Botany*. Haworth remarks that he can find no account of *N. recurvus* in authors and offers no suggestions respecting its origin.

The four species thus recognized by Haworth in 1812 were described together in his Suppl. Pl. Succ. et Narciss. Revisio, pp. 148–151 (1819), as follows:—

1. N. POETICUS. Foliis erectis angustis; corollæ laciniæ imbricantes tortæ; 3 exteriores oblique recurvantes late obovatæ mucrone valido, 3 interiores, fere horizontales angustiores mucrone minori; corona matura horizontaliter expansa lutea rugosa margine scarioso crenulato subrecurvato carmosino croceove; antheræ 3 longiores tubum stylumque paululum superantes, 3 intra tubum humiliores.

N. poeticus Salisb. in Hort. Trans. i. p. 365, at absque ullo charactere; *N. Poetarum*; *N. poeticus* L. Sp. Pl. ed. 2, p. 414, cum sequentibus indefinitè; *N. medio purpureus præcox* Park. Par.

Hab. in Græciâ et in pratis prope Languedoc sec. Salisb. *l. c.* Floret in Aprilis.

2. N. RADIIFLORUS. Corollæ laciniis horizontalibus spathulato-obovatis non imbricatis; coronâ acetabuliformi ore scarioso crenulatissimo intense coccineo; antheris inferioribus tubo semi-inclusis.

N. radiiflorus Salisb. Prod. p. 225, et Hort. Trans. i. p. 365; *N. angustifolius* Curt. 193; *N. medio purpureus stellaris* Park. Par.

Hab. in pratis humidis subalpinis Helveticis sec. Salisb. *l. c.* Floret in Aprilis.

This is stated to have leaves scarcely narrower than in the preceding species, but a more slender scape.

3. N. MAJALIS, with the diagnosis already applied to *N. patellaris* under the original description of *N. recurvus* (Synop. *l. c.*).

N. majalis Curt. 193, at end; *N. patellaris* Salisb. Prod. p. 225; *N. poeticus* Eng. Bot. 275; *N. medio purpureus maximus* Park. Par. Floret Maio.

Variat α. Antheris tribus solum extra tubum exertis.

β. *exertus* (middle-flowering). Antheris omnibus constanter extra tubum exertis.

N. medio purpureus serotinus Park. Par.

This variety *exertus*, which Haworth saw but once in a nursery at Brompton in 1809, is further described as having

narrow leaves, subreflexed and nearly spathulate perianth-segments, and a spreading, yellow corona "circulo carmosino serrulatim erosulo."

γ. *plenus.* *N. albus multiplex* Park. Par.

4. N. RECURVUS, with a repetition of the original diagnosis; stated to flower in May with *N. majalis* and to have been cultivated before 1809.

Haworth's later views respecting these plants are embodied in his *Monograph of Narcissineæ*, pp. 14–15 (1831), where the number of *poeticus*-species is raised to twelve. In this work he departs from his own and Salisbury's earlier views by identifying the specimen in the Linnean Herbarium with the *N. majalis* of his *Revisio*, to which he transfers the name *N. poeticus*, renaming as *ornatus* the *N. poeticus* of his *Revisio* and of Salisbury. He also separates for the first time *majalis* and *patellaris*, and introduces several new forms.

With these modifications Haworth's species stand thus:—

* *Præcociores.*

1. POETARUM (saffron-cupped). Folia glauca inferne carinata 7 lineas lata apice flaccide recurva. Corollæ laciniis amplissimis cuneato-obovatis planis valde imbricatis; corona subpatellari (mox subdiscoidea), primo omnino crocea ore plicatissime crispo saturatiore mox a basi seorsum intense lutea denique albicante periente.

N. maximus medio purpureus Merian. Florileg. t. 144, fig. infer. Fl. April. 1831, in hort. Londini.

2. ORNATUS (flat-crowned saffron-rim). With a diagnosis abridged from that of *N. poeticus* in the *Revisio*.

N. poeticus Salisb. in Hort. Trans. i. p. 365, sine ullo charactere. *N. medio purpureus præcox* Park. Par. *N. tripodalis* Salisb. MS. ex laciniis 3 sæpe semireflexis.

Floret initio Aprilis cum sequente.

3. ANGUSTIFOLIUS (narrow-leaved saffron-rim). With the diagnosis of *N. radiiflorus* from the *Revisio*.

N. angustifolius Bot. Mag. 193. *N. radiiflorus* Salisb. Prod. p. 225, et Hort. Trans. i. p. 365, excl. synon. Parkinsoni. Narciss. Revis. p. 149.

Habitat Helvetiæ pratis humidis alpinis. Floret in Aprilis.

** *Medio tempore florescentes.*

4. SPATHULATUS (lesser saffron-rim). Corollæ minoris laciniis obtusis seu spathulatis, corona lutea, margine plicato crispo croceo.

In hort. medio seu fine Aprilis. An varietas minor certe præcocior *N. patellaris* infra?

5. ALBUS (slightly saffron-rimmed). Corollæ mediocris laciniis exterioribus obovatis, interioribus subovatis valde imbricatis, corona patula lutea, margine plicato-crispo subcroceo, mox marcescente albido.

N. albus Mill. Dic. ed. 8, No. 5. Schult. Syst. v. 7, p. 985.

In hort. med. Aprilis 1831.

6. DIANTHOS (Hort.).

7. TRIFLORUS (Hort.).

8. BIFLORUS Curt. Bot. Mag. 197.

**** Seriores florendi.*

9. RECURVUS. Diagnosed as before, with the addition "corollæ laciniis late ovatis retusis cum mucrone, coronæ margine sublate croceo interne parum albido sed minus quam in sequente."

Narciss. Revis. p. 151. Floret Maio, post medium.

β. gracilior. Foliis scapoque fere duplo angustioribus glaucescentibus minus planis, paucis solum recurvis sed erectis inde scapi sæpius altitudine; coronæ croceo margine sæpe tenuiore.

10. POETICUS Linn. (middle-sized May). With the diagnosis of *N. patellaris* in the Synop. Appendix (*N. majalis* of the *Revisio*).

N. poeticus L. Sp. Pl. et ejus herbarii; *N. majalis* Curt. Bot. Mag. 193 (end); Narciss. Revis. p. 150.

β. flor. plen. albo.

γ. omnibus antheris exsertis. *N. poeticus* Red. Lil. t. 160.

11. PATELLARIS (large, broad May). Foliis 8 lineas latis, glaucis, carinatis. Corollæ amplissimæ laciniis orbiculato-obovatis, imbricatissimis, niveis, oris deflexis, 3 exterioribus subsemireflexis, 3 interioribus horizontalibus, coronâ patellari luteâ superne albâ ore denticulato-crispo croceo.

N. poeticus E. B. 275. *N. medio purpureus maximus* Park. Par.

β. fl. pleno albo cum croceo.

12. STELLARIS (long-petalled saffron-rim). Folia lorata viridia sive aliquantum glaucescentia. Scapus gracilis. Corollæ elongatæ stellares, laciniis obovato-cuneatis mucronatis tortis oris undatis reflexis distinctis, coronâ perluteâ patellari, margine plicato crenulato croceo mox intus albido, antheris omnibus subexsertis.

N. medio purpureus serotinus Park. Par.

Hort. post medium Maii.

After the publication of his Monograph Haworth contributed the account of *N. recurvus* in Sweet's *British Flower Garden*, No. 188 (1833), where the plant is beautifully figured. He suggests here that it is indigenous in Southern Europe, and adds the interesting remark that it is the common Narcissus of London flower-markets in May, while the rather smaller but equally beautiful *N. ornatus* is the market flower in April.

The same volume contains another good plate (No. 132) under the name of *N. stellaris* Haw. The accompanying description is not written by Haworth, but probably by Sweet; and the plant is shown with flat and spreading perianth-segments, a small corona with a very narrow white zone narrowly edged with bright scarlet, and seemingly shortly ellipsoid, trigonous fruits.

N. poeticus L. is next dealt with in Dean Herbert's *Amaryllidaceæ*, p. 317 (1837), where ten forms are admitted as varieties, *viz.*:—

** Early flowering, April.*

(1) *grandiflorus* Sabine MS. (*Poetarum* Haworth), (2) *angustifolius* Bot. Mag. 193, (3) *ornatus* (flat-crowned saffron-rim) Haw., (4) *spathulatus* Haw., (5 ?) *albus* Haw.

** *Late flowering, May.*

(6) *majalis* Eng. Bot. 275, (7) *recurvus*, (8) *patellaris*, (9) *stellaris* Haw., (10) *verbanensis* (tab. 37–2)—a dwarf form with very narrow leaves and reflexed perianth-segments tinged with yellow at the base, growing in a pasture by Lake Maggiore, near Baveno.

Of these varieties Herbert states that he does not know *ornatus*, *spathulatus*, or *albus*, and as the first of these was a common market flower in his day (*vide* Haworth's statement above), it may be assumed that, like Curtis, he confused it with *angustifolius*. From this it is fairly clear that his knowledge of Poet's Narcissi lacked the critical accuracy shown by Haworth. The figure of var. *verbanensis*, which is somewhat crude, portrays a slender plant with oblong or elliptic, acute and slightly reflexed perianth-segments, and a small, cupped corona with 3 stamens only exserted. An apparently authentic specimen preserved in Herb. Kew shows narrow and rigidly deflexed perianth-segments—a feature that may be suspected of resulting from the flower being already faded when pressed, and not a real character of the living plant. The dwarf Narcissi of the hills above Baveno certainly do not show such flowers, and their perianth-segments are generally broad and imbricated. Besides the variety *verbanensis*, *majalis*, *recurvus* and *patellaris* are figured by Herbert, but their features are ambiguous and it is not easy to see what differences are intended to be indicated.

After Herbert's time, interest in Daffodils languished in Britain, and no further systematic work on them appeared till Burbidge & Baker's *The Narcissus* was published in 1875. In this book all the forms are placed under one species, *N. poeticus* L., of which the type is said to flower late in April. Five varieties are added, viz. *radiiflorus* (*N. angustifolius* Curt.), *stellaris* (*N. stellaris* Haw.), *recurvus* (*N. recurvus* Haw.), *poetarum* (*N. poetarum* Haw.), figured as *aurantiacus*, and *verbanensis* Herbert; and it is noted that *N. spathulatus* Haw. scarcely differs from var. *radiiflorus*, and that *N. ornatus* Haw. is similar to var. *poetarum*.

Soon after the publication of *The Narcissus* the late Mr. Peter Barr began to revive interest in the cultivation of Daffodils, and for several years endeavoured to re-collect and identify the plants described by Haworth and other older botanists, some of which had been almost forgotten. The result of this work appeared in 1884 in a fresh classified list printed in the *Florist and Pomologist*, and practically reproduced the same year in *Ye Narcissus or Daffodyl Flowre*, in which F. W. Burbidge collaborated. This list has formed the basis of modern horticultural catalogues, and in it (p. 101) Barr remarks that *N. poeticus* divides naturally into early and late flowering varieties, and proceeds to follow Haworth, but with some important alterations. His arrangement of Poet's Narcissi stands thus:—

* *Early flowering.*

angustifolius (*radiiflorus*), perianth narrow, cup margined orange-red; *ornatus* (flat-crowned saffron-rim), perianth broad and well

formed, cup margined with scarlet; *grandiflorus*, perianth very large, cup suffused with crimson; *poetarum* (saffron-cupped), perianth broad, cup suffused with orange-scarlet; *spathulatus* (lesser saffron-rim), cup small, edged with saffron (said to be out of cultivation); *tripodalis*, cup full size and margined with saffron.

** *May flowering.*

poeticus of Linnæus (middle size), flower one inch in diameter, sturdy and finely formed; *recurvus* (drooping-leaved), perianth reflexed, with a slight doubling inwards longitudinally; *majalis* (Herb. Amaryll. pl. 40, fig. 2), perianth well formed and generally flat, cup edged with saffron, leaves erect; *stellaris*, with bladder-like spathe, cup margined with saffron; *patellaris* (large, broad-petalled)—*N. purpureus maximus* Park. tab. 75, fig. 2—perianth flat, finely formed, with large cup edged with saffron, leaves erect; *verbanus* (*verbanensis*), perianth slightly tinged with cream, cup edged with saffron; in gardens taller and larger-flowered than Herbert's figure.

On comparing this arrangement with that in Haworth's Monograph, it will be first observed that *ornatus* and *tripodalis* appear as distinct plants, whereas *tripodalis* is simply quoted by Haworth as a synonym for the other. Barr's *ornatus*, however, is not the plant of Haworth, but the common early-flowering form of the present day sold under that name, which Barr appears to have transferred to it, leaving Haworth's original *ornatus* as *tripodalis*. It is remarkable how completely this new plant has displaced Haworth's species, which in 1833 was the common English market Narcissus during the month of April. The change is no doubt due to the more beautiful flower of the newer plant, and perhaps also to a more vigorous habit. I understand from Mr. P. R. Barr and Rev. G. H. Engleheart that this modern *ornatus* was introduced into Britain, probably about 1870, through H. Vilmorin, of Paris, who obtained it first in the South of France.

Of saffron-cupped plants Barr gives two forms, viz.: *poetarum*, described by Haworth, and *grandiflorus*, following a name substituted by Herbert for *poetarum*, but now taken to represent a separate form not previously distinguished. Among the late flowering forms the most noteworthy points are that Barr distinguishes *stellaris* by its bladder-like spathe, a curious feature not mentioned by any of the older writers and not shown in Sweet's very accurate figure; and introduces *poeticus* of Linnæus as a plant distinct from *N. majalis* and characterized chiefly by its extremely small flowers.

Barr's arrangement of these plants was soon followed by an entirely different classification in Mr. Baker's *Amaryllideæ*, p. 11 (1888), where one species, *N. poeticus* L., is admitted, with a subspecies, *N. radiiflorus* Salisb. (*N. angustifolius* Curt.). The specific type is said to flower in May, and *N. patellaris* Haw. (E. B. 275), *N. spathulatus* Haw., *N. stellaris* Haw., *N. recurvus* Haw., *N. poetarum* Haw. and *N. tripodalis* Salisb. (*N. ornatus*

Haw.) are reduced to the rank of forms. The subspecies *radiiflorus* is distinguished by its narrower leaves, slender peduncles, and perianth-segments cuneately narrowed in the lower half; and of this *N. verbanensis* is considered a dwarf form. No allusion is made to differences in the form of the corona.

By this date the great modern revival of Daffodil growing in Britain had fairly begun, as is evident from the list of one hundred best Narcissi which Burbidge was able to recommend for cultivation in Journ. Roy. Hort. Soc. xi. p. 92 (1889), the Poet's forms included being *N. poeticus*, *N. ornatus*, *N. poetarum*, *N. grandiflorus*, *N. recurvus*, *N. patellaris*, *N. majalis*, N. "Marvel" and *N. stellaris*. It may be noticed that *N. angustifolius* and *N. tripodalis* do not figure in this list, but both of them were exhibited at the Daffodil Conference of April, 1890 (Journ. Roy. Hort. Soc. xii, p. 365). The form with inflated spathe which Barr referred to *stellaris* is presumably that intended by N. "Marvel," under which name it has been subsequently sold.

In 1903 the Rev. E. S. Bourne issued his *Book of the Daffodil*, in which (p. 25) a list of *poeticus*-forms is given, closely following Barr's but recognizing a connection between *angustifolius* and *verbanensis*. This list attributes a probable Italian origin to the modern *ornatus*.

The horticultural feature of quite recent years among the Narcissi is the second disappearance from English gardens of many of the older forms which Barr re-collected, this time owing to the advent of a multitude of modern hybrids, some undoubtedly of superior beauty. Among the Poet's forms *N. recurvus* and Barr's *ornatus* have held their own and are perhaps grown in greater myriads than ever, but it has again become difficult to find *patellaris*, *majalis*, *stellaris*, *angustifolius*, and *ornatus* of Haworth, which seem well on the way to extinction in Great Britain. This renders it additionally desirable to put on record the history and characters of these plants, which so long adorned the gardens of our ancestors and are the parents of our modern hybrids.

Turning from British to Continental writers, we find *Narcissus poeticus mediocroceus purpureus* described as an early flowering plant of Southern France by Lobel in Stirp. Adv. Nov. p. 50 (1570), and three forms were recognized as early as 1583 in Dodonæus's Stirp. Hist. Pemptades, p. 223, under the name of *N. medio purpureus*, a figure of the plant being furnished.

In the Hist. Rar. Pl. of Clusius (v. ii, p. 156 (1601)) three of these plants are separately described. The first is but briefly diagnosed without a distinguishing name and is said to grow in meadows in Narbonne. The second, *N. latifolius* vi, referred to as abundant above Gaming, in Lower Austria, is stated to have narrow leaves, sweetly-scented, stellate flowers, with a small, red-edged corona (parvum calicem), unequal stamens and trigonous fruits. Of the third, *N. latifolius* vii, Clusius remarks: "Latiora reliquis folia . . . flos magnus, odoratus, sex albis foliis medium calicem pallidum cingentibus cujus fimbria ex pallido purpurascit;

flori succedit satis crassum triangulare caput . . . radix superiore crassior." This is a late flowering plant, presumed to have been brought from Styria, and noticed by Clusius in gardens at Frankfort.

The three species of Clusius were maintained in the *Pinax* of Caspar Bauhin (p. 48 (1623)) under the names of *N. albus circulo purpureo*, *N. niveus odoratus circulo rubello*, and *N. albus magno odore flore circulo pallido* respectively. For the first of these *N. mediopurpureus præcox* Gerard is quoted as a synonym, and for the third *N. mediopurpureus* Ger. Icon. Bauhin (*l. c.* p. 49) further admits two other species, viz. *N. alb. circulo croceo vel luteo* (*N. medio-purpureus præcox* Ger. Icon.), which differs from the first-named chiefly in the colour of the corona-ring; and, lastly, *N. albus circulo croceo minor*.

In Johann Bauhin's Hist. Plant. ii, p. 600, published as a posthumous work in 1651 but written before his brother's *Pinax*, three species of Poet's Narcissi appear. The first, *N. medio purpureus*, is figured and described at some length, the salient features being "folia latitudine semunciali . . . florem medium obtinet corona fimbriata orâ rubenti, infra quam circulus exalbidus, aliusque huic subjectus luteus; sena in fistuloso canali stamina, tria modice elata, reliqua tantillum apice proferentia." The plant intended, which the figure shows to be similar to that described by Gerard under the same name, is said to flower in gardens at Bâle during May, and to grow also in gardens in Belgium, Germany and England. It is also referred to as a native plant at Narbonne. J. Bauhin's second species is *N. medio-purpureus magno flore folio latiore* (Clusius Hist. vii), which seems to be taken from Clusius without personal knowledge of the plant; and his third is *N. mediopurpureus minor*, which is the *N. latifolius* vi of Clusius. This is clearly figured with stellate flowers and narrow perianth-segments. The early-flowering flat-crowned plant is not mentioned in the *Historia*, and was probably confused with *N. medio-purpureus*, as was afterwards done by Ray.

After Bauhin's time interest in these plants seems to have abated, although their differing forms were still recognized by Haller and Magnolius; and it is fairly certain that during the eighteenth century most types of Narcissi became unfashionable, both in botany and horticulture. The varying forms of Poet's Narcissi known to the older botanists were accordingly represented in Linnæus's Spec. Plant. ed. 1, p. 289 (1753) by one species, *Narcissus poeticus*, and this alone continued to be recognized on the Continent till long after the days of Salisbury and Haworth.

N. poeticus was described by Linnæus thus:—"N. spatha uniflora, nectarii limbo rotato brevissimo scarioso crenulato, Hort. Ups. 74. N. foliis ensiformibus floris nectario rotato brevissimo, Hort. Cliff. 134. Roy. Lugdb. 35. Sauv. Mons. 17. *N. albus circulo purpureo* Bauh. Pin. 48. *N. medio purpureus* Dod. Pempt. 223.

"*β. N. medio purpureus multiplex* Bauh. Pin. 54.

"Habitat in G. Narbonensi, Italiâ."

It will be seen, alike from the rotate corona, the reference to Bauhin, and the habitats cited, that Linnæus had primarily in view an early-flowering, flat-crowned form.

The sheet of *N. poeticus* in the Linnean Herbarium is a garden specimen showing two flowers and one leaf in fair preservation. As a type it is not very adequate, but it can still be seen that the leaf is 8 mm. broad, and the flowers of moderate size, with a thick spathe, deep green perianth-tube, oblong, mucronate segments not much narrowed below, and the corona apparently cup-shaped with the stamens hidden owing to lateral compression when drying. Though its precise characters may be indeterminable, the specimen certainly recalls the *N. patellaris* of Salisbury and the plant figured in *English Botany*.

One of the finest existing plates of *N. poeticus* was produced in 1807 in Redouté's *Liliaceæ*, iii, No. 160. The accompanying text refers to the plant as a native of meadows of the temperate part of Europe, flowering in May, and two varieties are mentioned, a. *latifolius*, having leaves 15–18 mm. broad, and b. *angustifolius* (*N. angustifolius* Curtis), with leaves only 6–8 mm. broad. The latter variety is that depicted in the plate, where the flower is shown with spreading, obovate perianth-segments, imbricate above and narrowed in the lower half much as in Barr's *ornatus*, and with a nearly flat, yellow corona, narrowly edged with red without any white zone, and showing six exserted and subequal stamens. Redouté's description suggests no floral distinctions between his two varieties.

In 1843 Koch (Synopsis Fl. Germ. ed. 2, p. 811) separated from *N. poeticus* as a distinct species the slender, narrow-leaved form with stellate flowers and cupular corona which occurs in various mountain and subalpine districts of Central Europe and had already been distinguished by præ-Linnean authors. This he described as *N. radiiflorus* Salisb. Prod. 225, and differentiated the two plants thus :—

"*N. poeticus* L. . . . ovario sub anthesi compresso-ancipiti, coronâ in patellam planiusculam expansâ . . . staminibus tribus stylum paulum superantibus, tribus brevioribus fauci inclusis, perigonii laciniis ovatis. In pratis etc. reg. calid.

"*N. radiiflorus* Salisb. . . . ovario sub anthesi tereti, coronâ cupulari erectâ . . . staminibus omnibus cum antherâ tubo longioribus. In montosis et subalpinis. Bulbus magis oblongus quam in præcedente, planta minor, folia et caulis angustiora, ovarium gracilius oblongum . . . laciniæ perigonii angustiores, magis dissitæ, albæ quidem . . . nec niveæ, corona brevis, a basi erecta, non explanata. . . ."

This account of *N. radiiflorus* recalls Clusius's description of *N. latifolius* vi from Lower Austria, except in the form of the fruit.

Koch's two species are illustrated in Reichenbach's *Icones*, v. 9, pl. 364 (1847). The figure of *N. poeticus* (No. 808) is indifferent, appearing to represent a dwarf plant with a dirty whitish perianth and small cupped corona, which is perhaps not the

author's intention. The other figure, *N. radiiflorus* (No. 809), is more satisfactory, and fairly depicts a form of the plant described by Koch with narrow perianth-segments.

The next important European Flora to appear, Grenier & Godron's *Flore de France*, admits (v. iii, p. 256 (1855)) one species only, *N. poeticus* L., defining the corona as "très courte, étalée en coupe." Parlatore's Fl. Italiana, v. iii, p. 116 (1858), adopts Koch's two species, but amends the diagnosis of *N. poeticus* L. thus: "... perigonii laciniis subreflexis, interioribus ovato-oblongis ... exterioribus latioribus late elliptico-obovatis ... staminibus superioribus coronâ plus quam duplo brevioribus." Willkomm & Lange (Fl. Hispanica, v. i, p. 156 (1861)) describe *N. poeticus* L. as inhabiting the mountain region of Central and Eastern Spain, but do not refer to *N. radiiflorus*.

In 1866 Schur in Plant. Transsilv., p. 657, described as a new species *N. seriorflorens*, a late-flowering Transylvanian plant closely related to *N. radiiflorus*, having dirty-white, obtuse, mucronulate perianth-segments and a very small, subdiscoid corona. Three years later, in Œsterr. Bot. Zeitsch., xix, p. 205, the same author described another similar Austrian plant as *N. stelliflorus*. This is characterized by stellate flowers with obtuse, mucronate segments, a slightly cupped corona about 8 mm. broad and 2 mm. deep, and a compressed and obovate ovary. Schur expresses doubt as to its distinctness from his *N. seriorflorens*.

In Boissier's *Flora Orientalis*, v, p. 150 (1881), *N. radiiflorus* Salisb. Prodr. is included as a native of the mountains of Northern Greece and of Mt. Œta, the description agreeing with that of Koch and Parlatore, with Reichenbach's figure (No. 809) cited in illustration. Halacsy (Conspectus Fl. Græc. iii, p. 202 (1904)) gives *N. poeticus* L. as a Greek plant in addition to *N. radiiflorus*. Like Boissier, he generally follows the descriptions of Koch and Parlatore, and he cites Redouté's figure for *N. poeticus*, quoting as its habitats Chaliki, in Thessaly; Neuropolis in Mt. Pindus; and Bœotia.

The most recent arrangements of these plants are those in Ascherson & Graebner's *Synopsis Flora Mitteleuropa* (1906) and Rouy's *Flore de France* (1912).

Ascherson & Graebner (*l. c.*, v. iii, p. 396) recognize one species only, *N. poeticus* L., with a subspecies, *N angustifolius* Curtis (*N. radiiflorus* Salisb. Prodr.; Koch, Synop. ed. 2, p. 811). The plant regarded as the specific type seems to be the *N. poeticus* of Koch and Parlatore, but *N. majalis* Curt. is the only synonym quoted. The perianth-segments are described as obovate and imbricate. The account of the subspecies *angustifolius* (*l. c.*, p. 397) coincides sufficiently with that of Koch and Parlatore, but, as in the specific type, the form of the corona is undefined, and it is left to be inferred that this organ is flat in the type and not so in the subspecies.

At the end of the diagnosis of the type the authors remark: "Ziemlich veränderlich in Gärten: von den zahlreichen Formen sind bemerkenswerth:—

"B. *spathulatus* (*N. spathulatus* Haw.) [flowers smaller, earlier than in the type]; C. *poetarum* (*N. poetarum* Haw.) [flowers larger with reddish corona]; D. *tripedalis* (*sic*) (*N. ornatus* Haw.) [with narrower, reflexed perianth-segments]; E. *patellaris* (*N. patellaris* Salisb.) [robust, with imbricated perianth-segments; a frequent garden plant; late-flowering]; F. *stellaris* (*N. stellaris* Haw.) [late-flowering, to which, according to Baker, belongs *N. recurvus* Haw., with drooping leaves]."

This list of forms has evidently been taken bodily from Mr. Baker's *Amaryllideæ*, with results not entirely fortunate. It may well be doubted whether *N. spathulatus* flowers earlier than the authors' type, which does not seem to be the plant regarded in this light by Mr. Baker; and the statement that *N. patellaris*, now nearly extinct in British gardens, is a frequent garden plant seems open to question, although it may still be correct for Germany, where it was observed by Clusius. But it appears possible that the collaborateurs have confused it with *N. recurvus*, which they have identified with *N. stellaris* through a curious misreading of Mr. Baker's text.

Under the subspecies *angustifolius* Ascherson & Graebner give three further forms, viz.:—B. *verbanensis*, the plant described by Herbert; C. *fallax* (*N. radiiflorus*, f. *fallax* Beck), with broader, imbricated perianth-segments, found in Herzegovina and Küstenland; and D. *stelliflorus* (*N. stelliflorus* Schur), stated to have smaller flowers and shorter, obovate ovary.

Rouy's *Flore de France*, v. xiii, p. 53 (1912), follows the arrangement of Ascherson & Graebner, modified by the reduction of *N. angustifolius* Curt., for which the name *N. radiiflorus* Salisb. Prodr. is used, from a subspecies to a "race." *N. majalis* Curt. is cited as a synonym of the type, but of Salisbury's *N. patellaris* and all of Haworth's names no mention is made, and no varieties are included except what seems to be the colour-form *sulphureus* previously noticed by Grenier & Godron. *N. biflorus* Curtis follows *N. radiiflorus* as a subspecies of *N. poeticus*. In view of the abundance and variety of Poet's Narcissi known to grow in France either as wild or naturalized plants, and the repeated allusions to the occurrence of different forms there by præ-Linnean and other early authors, this cursory treatment is most unsatisfactory.

The botanical history of the Poet's Narcissi has now been generally traced. It has been seen that several forms were distinguished by early authors, chiefly in the first half of the seventeenth century, both in Britain and on the Continent. They were known to the British writers as inhabitants of the garden, but Clusius and the two Bauhins treated them also as wild plants and afford some information respecting their origin. The work of these early botanists, however, seems to have been permanently overlooked by later Continental writers, who, since the time of Linnæus, have recognized not more than two species, both widely distributed natives of Southern Europe, and have almost entirely neglected the other forms, which have been regarded solely as

plants of the garden. In Britain, neglect of these Narcissi has not been so continuous, for a recrudescence of interest in them took place early in the nineteenth century, when they were dealt with first by Salisbury and afterwards more elaborately by Haworth, while again in recent years they have commanded attention, though mainly from a horticultural standpoint. Haworth's work is especially valuable from his detailed knowledge of a wide range of the living plants, but it must be observed that, although familiar with Parkinson, he does not attempt to identify his species with those of Gerard, Clusius and Bauhin, and apparently knew nothing of the wild forms in their native habitats.

It is evident from the recognition of several distinct forms of these Narcissi by these early writers that, when living, they are plants of different facies. As has been shown, Clusius, who mentions three, himself saw and distinguished two wild forms, one in Narbonne and the other in Austria, and of the third, which he noticed in gardens at Frankfort, he endeavoured to ascertain the origin. Caspar Bauhin seems to have satisfactorily identified these three plants of Clusius, besides distinguishing two additional forms; and Magnolius (Bot. Monsp. p. 181 (1676)) mentions two of Bauhin's forms, one flowering early and the other late, as natives of Montpelier in the South of France.

It is not a little remarkable that in contrast to this more critical treatment by præ-Linnean authors, modern botanists have admitted one or two species only in this group. This is apparently explained to a large extent by the reliance of many recent writers on herbarium material, in which, as pointed out at the opening of this paper, the floral characters are largely obliterated or even rendered misleading, while the fruit, if not absent, is invariably indeterminable. And no serious effort seems to have been made since the time of Haworth to define accurately the garden forms and correlate them with those of known wild origin.

Since discovering *Narcissus recurvus* in the Alps I have endeavoured to obtain, for the purpose of describing them from life, fresh examples of the greatest possible number of forms of Poet's Narcissi, both wild and cultivated, and I think I have succeeded in securing all the older British garden plants, excepting *spathulatus*, *albus*, *dianthos*, *triflorus*, *recurvus* var. *gracilior* and *stellaris* of Haworth, *verbanensis* Herbert and Barr's "Marvel." Mr. P. R. Barr and the Rev. G. H. Engleheart have kindly assisted me in obtaining some of my desiderata. Of the forms not now readily obtainable in England, *N. radiiflorus* and *N. majalis* are still grown for sale at Lissadell, in Ireland, and *N. tripodalis* Salisb. by Messrs. W. B. Hartland, of Cork. In the case of *verbanensis*, I have been obliged to rely on my recollection of the plant as I saw it in abundance on the hills round Lake Maggiore in 1908, to supplement my herbarium specimens.

Before attempting to estimate the relationship between the wild and cultivated forms in this group, it is desirable to draw attention to the excessive variability sometimes seen with the former as contrasted with the comparative uniformity of many of

the garden forms; and it has been suggested with reason that this uniformity does not occur among wild Narcissi and is due to descent by bulb division from selections of the wild plants. Within certain limits this is no doubt right, for collectors would naturally choose the most shapely flowers—commonly those with broad perianths—when these show appreciable differences. But the variations in the wild Narcissi of any given habitat will probably be found, when analysed, to be less essential than is sometimes supposed. In the neighbourhood of Chateau d'Oex, in Switzerland, the Narcissus grows in myriads, and on first visiting the slopes whitened with its flowers, one's impression is that no two are precisely alike. Similar conditions prevail at Les Avants, as is well shown even in some of the local picture postcards. But, on examining these plants, it will be seen that the differences are mainly those of the perianth, the form and curvature of which are remarkably divergent, giving quite different aspects to different flowers. There are also considerable gradations in the length of the style, and the development of the fruits is by no means uniform. In all these states, however, the foliage, corona and stamens remain well-nigh unaltered, the variations of the corona being confined to the breadth and depth of colour of the reddish margin. Indeed, all these plants evidently belong to one species; and the conditions being such in two well-known stations for the Swiss Narcissus, it may be doubted whether the variations in the forms prevalent in other countries are not always mainly confined to the perianth, and whether gradations of the corona from the discoid to the cupular form or of the relative positions of the long and short stamens are ever met with unless through hybridity of distinct forms growing in juxtaposition. Moreover, truly wild Poet's Narcissi do not always vary greatly in their native habitats, as may be seen on Mount Mottarone, above Lake Maggiore, where the dwarf form *verbanensis* grows in abundance and is relatively uniform. It can thus be inferred that while forms selected from wild habitats may show comparatively uniform perianths which differ considerably from the average of the wild condition of the same species, and while such difference is perpetuated by root-division, it is highly improbable that divergencies in the same degree would ever be found in the foliage, corona or stamens.

This leads to a consideration of what organs must be regarded as the most important for affording specific characters among these Narcissi: and the examination of extensive and varied material has resulted in the following conclusions. The bulb in different forms shows a certain degree of variation in shape, ranging from ovoid-elongate to subrotund, and there are also differences in the colouring and texture of the scales. It is commonly larger in cultivated than in wild plants, as might be expected, but only in a few cases do its features seem clearly characteristic. In the foliage the differences are small, but some of them are seemingly constant. Narrow leaves are generally channelled and keeled, and broad ones distinctly flatter. In one or two forms the leaf tips are reflexed and drooping. The scape,

and pedicel within the spathe are much slenderer in some forms than in others, and vary also in compression and fineness of striation; the spathe shows gradations of length and thickness, and in one form it is inflated. The perianth differs very considerably in different forms, both in shape and texture; in some of these its shape and curvature are most inconstant, while in others, notably in *N. recurvus*, its uniformity is equally remarkable. In weak and starved plants the segments are generally narrower, less regular and more twisted than in more luxuriant individuals. The coronas of the various forms are unequal in size, and in shape range from flat and discoid, or even slightly convex, to distinctly cupular or cup-shaped; in rugosity and degree of plication of the margin there is also much variation, as well as in colouring, a peculiar white zone appearing in some forms within the red or crimson edge. The characters of the corona seem to be practically permanent in each form. The stamens, which are never equal in the generic section *Eu-Narcissus*, seem, in all of the plants that I have examined, except quite recent hybrids, to exhibit regularly one of two forms, which are termed in this paper "unequal" and "subequal." In the first of these, the anthers of the three shorter stamens are included in the perianth-tube and their tips only slightly exceed the anther-bases of the longer exserted stamens; in the second, all of the anthers are more or less exserted, and those of the three shorter stamens do not greatly fall short of the others. No good distinguishing features have been observed in the stigmas or in the style, which seems to vary in length in most forms and especially in such wild plants as I have examined. The fruit, which is not readily produced in the garden, and was ignored by Haworth in his descriptions, may be developed in almost every cultivated form by keeping fertilized flowers in water after the fading of the perianth. The shape of the capsules thus obtained appears to be constant in each form, allowing for the unequal development of the seeds that at times occurs, but it varies very greatly in the different forms. Thus, in *N. radiiflorus* the fruits are terete and narrowly oblong or pyriform, while in other plants they are trigonous or trilobate, and in one form nearly globose. My experience with wild plants is not sufficient to confirm that a characteristic form of fruit equally distinguishes every wild form, but such would appear to be probable. I have not succeeded in detecting any appreciable differences in the seeds.

It results from these conclusions that among Poet's Narcissi the bulb, foliage, scape, perianth, corona, stamens and fruit may all exhibit characters useful for the determination of species. Modern authors have very generally laid the greatest stress on the shape of the perianth-segments, which is usually visible in herbaria, but as this is undoubtedly very variable in certain wild forms, it seems doubtful whether it is of equal importance with the shape of the corona, the arrangement of the stamens and the form of the fruit—characters which, though obscured in dried specimens, appear to be constant or susceptible to little variation. In this connection it may be remembered that the form of the

corona is the basis of Mr. Baker's primary division of the genus. Major A. H. Wolley-Dod informs me that on the Italian Riviera the perianth of the wild *Narcissus Tazetta* also is remarkably variable.

The features of the corona in some of the species of the older botanists have been obscured by the curious terms that have been used in its description. The word "patellaris," which was first employed by Salisbury as a specific epithet for the broad-leaved, May-flowering form well known in his day has been especially misunderstood by recent writers, who have assumed that it indicates a flat or plate-like corona. That this is not so may be seen from Salisbury's original diagnosis, in which the corona is termed "cotyliform"—like a cup or liquid-measure; and this is further confirmed by Salisbury's own drawings of *N. patellaris*, where this organ is clearly depicted as cupular in form. The term "patellaris" was likewise accepted in the same sense by Haworth, who applied it to the forms with cup-like coronas, such as *recurvus*, *patellaris* and *stellaris*, while for the flat crowns the term "subdiscoidea" or "complanatim expansa" is commonly used. A more abstruse point of this kind is the exact meaning of "acetabuliform," as applied to the corona of *N. radiiflorus* by Salisbury in contrast to the cotyliform corona of *N. patellaris*; and copied by Haworth. In these two plants the corona is almost equally cup-shaped, but in *N. radiiflorus* it is very much smaller than in the other and is so represented in Salisbury's drawings. An "acetabulum" was a small cup or measure of $\frac{1}{8}$ pint, while a "κοτύλη" was a cup or measure of $\frac{1}{2}$ pint, and it appears probable, though at first sight it looks far-fetched, that in using the terms "acetabuliform" and "cotyliform," Salisbury simply intended to convey that *N. radiiflorus* had a small, cupped corona only one quarter as large, in cubical content, as the cup of *N. patellaris*—which is indeed about the true proportion. The difference in the size of the corona in these two classes of plants is mentioned by Clusius, who speaks of the "parvum calicem" of the one and the "medium calicem" of the other.

It now remains to estimate the affinities of these polymorphic plants and to place them in a natural arrangement. The fact that they have sometimes been regarded as all belonging to a single species, while other authors have admitted several species among them, culminating in the twelve of Haworth's Monograph, is sufficient evidence that they must be treated as critical forms. Whether, when divided as by Salisbury and Haworth, the several species possess the average value of species among kindred monocotyledonous genera, I hesitate to say, but to unite them all as one, viewing the different forms as subspecies, races, varieties and garden-forms, seems scarcely possible in view of the standard of species adopted in the recent Monographs of the Crocuses and Irises, genera with which Narcissi may reasonably be compared. It is clear that the wild forms in their different habitats have not yet received due attention from botanists having a good critical knowledge of the whole group, and sufficient accurate information

has not yet been accumulated to enable many of them to be separated as species or united as varieties under others with any great degree of confidence. I therefore think it will serve the most useful purpose in this paper to maintain, as a tentative measure, such species already described as seem to be plants clearly separable from each other in apparently important characters, and to give specific rank also to any other forms that may seem equally distinct. This involves the recognition of several of the species of Haworth.

The most definite means of segregating this group of Narcissi, and the one most generally adopted in modern botany is that proposed by Koch (Syn. Fl. Germ. *l. c.*), in which two species are admitted. The first, *N. poeticus* L., is diagnosed as a plant with ovate perianth-segments, a flat corona, three stamens included in the perianth-tube and compressed fruits, while *N. radiiflorus* is specifically distinguished as a slenderer plant, with narrower leaves and perianth-segments, a cupular corona, all the stamens exceeding the perianth-tube and narrower, terete fruits. The two plants have usually been kept apart by subsequent authors, either as species or subspecies, but their distinguishing characters, which Koch accurately pointed out, have been largely lost sight of, and the features of the perianth, which show the most obvious differences in the herbarium, have been generally emphasized as of the chief importance.

Of the two plants described by Koch it will be seen that his *N. poeticus* agrees in its flat corona with the *N. medio-purpureus præcox* of Parkinson and Gerard, which is the *N. albus circulo purpureo* of Bauhin's *Pinax*, cited for *N. poeticus* by Linnæus, who likewise emphasises the flat or rotate corona. It is also identical with *N. poeticus* Salisb. in Hort. Trans. i. 365, which Haworth, who was Salisbury's contemporary, states is synonymous with *N. tripodalis* Salisb. MSS. (Mon. Narciss, *l. c.*). This identity is confirmed by figures 1 and 2 of the plate of this paper, which have been reproduced from Salisbury's own drawings of his *tripodalis*; and the plant itself, which the older British authors described from the garden and Salisbury received from Montpelier, may still be obtained in Ireland for comparison.

In the case of *N. radiiflorus* Koch's description and Salisbury's original brief diagnosis in his *Prodromus* offer no essential contradictions. Its floral characters are well seen in the plate of this paper, figures 3–5, the originals of which were drawn by Salisbury, and the exact form of the flower and of the narrow fruit may be further confirmed from fresh Irish-grown plants, as already mentioned. Koch cites several Austrian stations for *N. radiiflorus*, which, although familiar to English gardeners of the eighteenth century, was not certainly cultivated here at a much earlier date. It may possibly be the *N. medio-purpureus præcocissimus* of Gerard, but of plants with stellate flowers Parkinson seems to have known but one form, *N. medio-purpureus stellaris*, which is more probably *N. stellaris* Haworth—a plant for subsequent consideration.

It is to be regretted that when Koch drew up his account of *N. poeticus* and *N. radiiflorus*, he did not also deal with the late-flowering plant distinguished by Curtis as *N. majalis* and by Salisbury as *N. patellaris*. This may have resulted from his acquaintance with it as a garden-form only, and he perhaps did not consider it a possible native of Central Europe. But the treatment has proved unfortunate, for Koch's method appears to have been generally followed by succeeding authors in treating of the Poet's Narcissi of other European countries and the distinctness of *N. majalis* has been consequently overlooked. Curtis and Salisbury certainly thought it the most striking plant of the group, for their earliest work was to separate it from the two above-mentioned early-flowering forms which at first they failed to distinguish. It will be seen, too, by referring to the synonyms which they cite, that the præ-Linnean writers also were well acquainted with this plant, and the likeness of the *N. medio-purpureus* figured in the works of Gerard and J. Bauhin to the drawings of Salisbury's *N. patellaris* accompanying this paper (figs. 6 and 7) is at once apparent. The characteristic colouring of the cupped corona of this Narcissus is mentioned by Clusius (*N. latifolius vii*), described in some detail by J. Bauhin under *N. medio-purpureus* (Historia, *l. c.*), and is reflected in Caspar Bauhin's name *N. albus magno odore flore circulo pallido*. In Britain it seems to have formerly been one of the best known of garden Narcissi, for it is the *N. medio-purpureus* of Gerard, and its extensive cultivation is shown by its naturalisation in certain localities, which led to its introduction into *English Botany* as *N. poeticus*. Although the arrangement of the stamens in this plant coincides with that of the flat-crowned *N. poeticus*, the recurved perianth with very different corona (well seen in Salisbury's drawings), and the much more triquetrous fruit lend it the aspect of a distinct species.

The nomenclature of the three plants so far distinguished is not without difficulty, for it will have been noticed that while Linnæus's description of *N. poeticus* in *Species Plantarum* clearly points to a flat-crowned plant ("nectarii limbo rotato") and his name has been thus interpreted by Koch and other modern Continental botanists, the specimen in his herbarium resembles the *English Botany* form, as was observed by Sir James Smith, Salisbury and Haworth. By the rules of nomenclature the Linnean specimen becomes the specific type if the diagnosis or citations of Spec. Plant. can be understood to cover that particular form; and the Linnean name consequently remains with that type if the aggregate species is divided. In this case, therefore, Linnæus's specimen must be held the true *N. poeticus* if it is included in his account in Spec. Plant. The diagnosal definition of the corona as rotate, which is repeated in the citation from the *Hortus Cliffortianus*, shows clearly enough that a flat-crowned plant was primarily intended by Linnæus, and this view is supported by the habitats mentioned, which were early known to produce that form. The synonyms of the citation from Hort.

Cliff., too, as also those in Royen's Fl. Leydensis and Sauvages's Meth. Fl. Monspeliensis, likewise refer to an early-blooming flat-crowned form where they can be identified, with two possible exceptions, *viz.*:—*N. medio-purpureus* of J. Bauhin's *Historia*, the description and figure of which evidently represent a form or ally of *N. majalis*, and *N. albus circulo croceo vel luteo* of C. Bauhin's *Pinax*. In the *Historia*, however, it seems possible from the habitats mentioned that the early flat-crowned plant, which is not separately distinguished, was inadvertently included with *N. medio-purpureus*; and *N. albus circulo croceo vel luteo* appears to be a flat-crowned plant differing from *N. albus circulo purpureo* in the colour of the corona-margin and is perhaps the common Swiss Narcissus, although this identification has not been established. Of Linnæus's remaining citations, that from Dodonæus cannot be accurately interpreted, but the *N. albus circulo purpureo* of C. Bauhin's *Pinax* is conclusively shown by its synonyms to be the early-flowering, flat-crowned plant of Narbonne, and it is important to note that this was selected by Linnæus in preference to the *N. albus magno odore flore circulo pallido* of the same work, the late-flowering *N. majalis* or *patellaris*. In view of this evident intention of Linnæus, therefore, the somewhat ambiguous indirect citation from J. Bauhin can scarcely be held a sound basis for including this latter plant under *N. poeticus* Linn. in Spec. Plant., and it seems preferable to follow the authors who restricted this name to the flat-crowned forms rather than to regard it as covering also those with cupped coronas and to apply it strictly, as Haworth did finally in his Monograph, to the plant represented in Linnæus's Herbarium.

The second species described by Koch as *N. radiiflorus* has been indifferently named in modern works *N. angustifolius* Curt. and *N. radiiflorus* Salisb. The earlier author, Curtis, figures the plant intended with sufficient clearness but furnishes no description, and not only do his citations from Parkinson and Bauhin refer to the flat-crowned *N. poeticus* L., but all of his numerous synonyms likewise apply to that plant, as does also the Narbonne locality which he quotes as a habitat. It is obvious, therefore, that Curtis did not distinguish the true *N. poeticus* from the slender plant with small, cupped corona and exserted stamens which he figured, as his text referred wholly to the former while his plate portrays the latter; and it may be assumed that his intention was merely to separate these early-flowering and in some degree similar plants from the late-flowering and superficially more distinct *N. majalis*. In consequence, Curtis's *N. angustifolius* can only be regarded as a "nomen confusum." The next name, *N. radiiflorus*, is accompanied by a brief but explicit diagnosis in Salisbury's *Prodromus* which clearly describes the plant figured by Curtis, although the citation *in toto* of that author's *N. angustifolius* as a synonym is not entirely accurate. At that date Salisbury, like Curtis, did not fully appreciate the difference between this plant and *N. poeticus*, but as he amended this in Hort. Trans. of 1812, and no fresh name was published in

the interval, the validity of the name *N. radiiflorus* can scarcely be questioned.

The name to be retained for the late-flowering plant restored to specific rank by Curtis and Salisbury involves a careful scrutiny of those authors' synonyms. Curtis's *N. majalis* is founded, without figure or description, on *N. medio-purpureus serotinus* Park. and *N. albus magno odore flore circulo pallido* C. Bauhin; Salisbury's *N. patellaris* first on *N. majalis* Curt. and *N. latifolius vii* Clusius, to which *N. m. p. serotinus* Park., *N. poeticus* Sm. in Eng. Bot. and the specimen of the Linnean Herbarium were afterwards added. But it is questionable whether all of these citations refer to precisely the same plant. It will be recalled that Parkinson distinguishes two somewhat similar late-flowering forms under the names of *serotinus* and *maximus*, whereof the latter only is figured; and that what may well be the same two plants are described by J. Bauhin (Historia, l. c.) as *N. medio-purpureus* (with a figure) and *N. medio-purpureus magno flore; folio latiore* (Clusius Hist. vii). This larger plant is also the *N. . . . flore circulo pallido* of C. Bauhin, and thus the lesser and greater forms were included both under *N. majalis* and *N. patellaris*. Curtis's name, being the earlier, must therefore be used if the forms are united under one species. From Salisbury's citation from Clusius in the *Prodromus*, it would appear that when originally describing his *N. patellaris* he had the larger plant in view, and from this form his drawings seem to have been taken, but the diagnosis of *N. patellaris* furnished by Haworth for comparison with *N. recurvus* (Synop. Pl. Succ. *l. c.*) matches closely that of J. Bauhin's smaller plant, *N. medio-purpureus*, and in his subsequent Monograph Haworth distinguished as separate species the two forms recognised by Parkinson and J. Bauhin, identifying the lesser with the *N. poeticus* of the Linnean Herbarium and transferring Salisbury's name *patellaris* to the larger plant. This determination of the Linnean specimen is probably accurate, and to the same form, according to exsiccata in Herb. Kew, must apparently be referred the late-flowering plant of Montpelier, which Magnolius recorded under the name of *N. albus magno odore flore circulo pallido* C. Bauhin. The larger plant, according to both Salisbury and Haworth, is the *N. poeticus* of *English Botany*, the plate of which, with Haworth's description, sufficiently fixes its characteristic features, and shows that except for its taller habit, larger leaves, and broader white zone to its more finely fringed corona, it differs little from the smaller form. The breadth of the foliage (16-17 mm.) mentioned by Haworth for *N. patellaris* (Monograph, *l. c.*) exceeds that of any Poet's Narcissus that I have seen, the original specimen in Herb. Mus. Brit. from which the *English Botany* plate was drawn showing leaves considerably narrower. The general similarity of these two plants has been confirmed in my opinion by a comparison of fresh Kentish specimens, which, though smaller and poorly grown, certainly belong to the form shown in *English Botany*, with others, obtained from Lissadell as *N. tripodalis* and also

noticed in the gardens at Kew, which agree precisely with J. Bauhin's description and figure, and the early diagnosis of Haworth. Their fruits also are indistinguishable, and I therefore conclude that the two plants are conspecific. With this view *N. majalis* Curtis stands for the species, and as the plant primarily intended by Salisbury (*Prodromus*, l. c.) as *N. patellaris* is the larger form, this, being first segregated, becomes a variety *N. majalis* var. *patellaris*, leaving the smaller form to represent the specific type. It may be noticed that these two forms were referred by Barr to the same names *majalis* and *patellaris*.

In addition to the three species thus admitted a fourth must apparently be recognised in *N. recurvus* Haworth, which seems an essentially different plant from *N. majalis* owing to its characteristic foliage, peculiarly curved perianth of unusually constant form, absence of white zone in the corona and larger, more trilobate fruits. The origin of this plant in cultivation is somewhat mysterious. It appears to have been unknown to the præ-Linnean writers, for despite its foliage agreeing with that of Gerard's *N. medio purpureus præcocior*, its late flowering precludes its identification with that form; and while it may also recall Clusius's *N. latifolius vii*, it is much more probable that this was correctly identified by Caspar Bauhin with his *N. albus magno odore flore circulo pallido*. Then, although *N. recurvus* was not described till 1812 by Haworth, who had first observed it three years previously, by 1833, according to its describer, it had become a common English market flower, as it is at the present day. I have not been able to determine its frequency in Continental gardens, but neither Ascherson and Graebner nor Rouy seem familiar with it, and it may not be generally grown unless perhaps in quite recent years through importation from Holland. Its occurrence as an apparent native in the Swiss Valais has been mentioned at the beginning of this paper, and M. Beauverd has quite recently informed me of its discovery in a third station, where it grows in company with *Orchis sambucina*. Herbarium specimens are sometimes not readily separable from *N. majalis*.

A curious incident connected with *N. recurvus* is its association with its contemporary English name "The old Pheasant's Eye Narcissus." This name may be suspected of being a modern invention, for it cannot be found in the works of any writer on Narcissi before the present century and is not included in Britten and Holland's *Dictionary of Plant Names* (1886). It is shown in the recent *Oxford Dictionary* (1909), where the earliest references quoted are Routledge's *Every Boy's Annual*, May, 1872, and *The Westminster Gazette*, August, 1898! Haworth called *N. recurvus* the "drooping-leaved saffron-rim" and Barr inserted it in his List of 1884 as the "drooping-leaved" but it appears as the "Old Pheasant's Eye" in Barr's trade catalogue of 1900. Mr. J. G. Baker tells me that he has no knowledge of this as an old name for any Narcissus, and I am unable to trace any real evidence of its former use although it may have been a local appellation in certain southern counties. Its application to Narcissi is apparently

still in the process of extension, for market gardeners now employ it for the Poet's forms indiscriminately and I have this year heard these spoken of in the trade simply as "P. I.'s"! The "Pheasant's Eye" is, of course, a name commonly applied by authors to the red-flowered species of *Adonis*.

A figure of *N. recurvus*, under the MS. name of *N. curvilobus*, is included in the Salisbury collection of drawings in Herb. Mus. Brit., and it may be inferred from this that Salisbury regarded it as a species additional to the three distinguished in Hort. Trans. i. 365, of which his drawings have been reproduced for this paper. It will be observed that the same four species, under the same names as those now adopted, were also shown in Haworth's Narciss. Revisio in 1819. The further species established by Haworth in his Monograph remain to be considered.

The first of them, *N. poetarum*, is remarkable for its wholly red corona—a feature of which I find no independent mention in any Continental flora. The figure of Merian, cited by Haworth for this plant, resembles it in the form of the perianth, corona and stamens, but as the plate is uncoloured and accompanied by no description, the identity is uncertain. From the frequent recurving of the leaf-tips, *N. poetarum* may also be Gerard's *N. medio purpureus præcocior*, but on this point also the evidence is at least insufficient. Haworth's description was taken from a London garden plant, of whose origin he seems to have known nothing. I learn from the Rev. G. H. Engleheart that wild Poet's Narcissi of the Pyrenees occasionally show a similar colouration of the corona, but as the stamens of *N. poetarum* are subequal, it seems less closely related to the Pyrenean *N. poeticus* than to *N. radiiflorus*, which it further resembles in its narrow fruit. On the other hand, its distinctive perianth and flat corona are very different from what obtains in *N. radiiflorus*, and as it presents several points of distinction from each of the other known species, it cannot readily be reduced to a variety of any one of them. It also seems unlikely, from its peculiarly coloured corona, that it can be a hybrid form, and it therefore seems best to retain it as a separate species.

Haworth's next species, *N. spathulatus*, is less completely diagnosed than those preceding it, and the form of the corona is not stated. As no authentic specimen is known to exist and the plant is supposed to be lost to cultivation (*vide* Barr, *suprà*), its position must be regarded as indefinable.

N. albus, founded on a plant of Miller's (Dict. ed. 8, No. 5), is another doubtful form, possibly allied to *N. triandrus*. It was not known to Herbert and is not enumerated in Barr's list of *poeticus*-varieties.

Of *N. dianthos* Haworth the affinities are not certain as the plant, like *N. spathulatus*, is now lost to cultivation. It appears from the diagnosis to have been a two-flowered form allied to *N. radiiflorus*, or perhaps a hybrid of that species, combining channelled leaves 16 mm. broad with a white, substellate, waved perianth and a small, cupular, orange-coloured, strongly plicate-

lobed corona. Haworth's description was taken from a garden plant. *N. dianthos* was reduced to a variety of *N. biflorus* Curtis by Herbert, who, however, admits that the plant was unknown to him; and it does not seem to have been subsequently described. A wild two-flowered Italian specimen in Herb. Mus. Brit., as well as similar exsiccata at Kew, more nearly resemble the typical French *N. poeticus*, but present broader and more imbricated perianth-segments. These are perhaps simply natural twin-flowered sports. A similar form was lately sold by Messrs. Barr, probably propagated by bulb-division from solitary individuals showing the same abnormality.

N. triflorus Haw. is another 2–3-flowered form of which I have seen no authentic specimen. It is described as having channelled leaves only 10–12 mm. broad, a white perianth with ovate, imbricated segments, and a yellow, cupular corona. It is evidently akin to *N. biflorus* Curt., of which Herbert makes it a variety, adding that it produces perfect ovules and is found in the South of France.

Curtis's *N. biflorus*, which is placed next after *N. triflorus*, was well known in Britain in the time of Parkinson. From its uniformly abortive anthers and lack of ovules it seems an unmistakable hybrid rather than a real species or subspecies of this group, as it has sometimes been treated. Its imperfect anthers are depicted in Curtis's plate, and are still visible in much older exsiccata, such as those of the Sloane Herbarium. Haworth and Herbert seem to have doubted its hybridity, the latter suggesting that its barrenness was due to long cultivation. But it may be questioned whether other Narcissi, still fertile, have not been grown equally as long, and the plant is much more probably, as Barr thought, an ancient cross of some form of *N. poeticus* and *N. Tazetta* L. which has become widely spread owing to its exceptional vigour. Other slightly differing forms, perhaps not always barren, have been observed in Southern France in spots where *N. poeticus* and *N. Tazetta* grow together, and of these *N. triflorus* Haw. may be one.

Haworth's last species, *N. stellaris*, is of particular interest, for not only is it more adequately diagnosed in the Monograph than some of those preceding it, but it is fully described and well figured in Sweet's *British Flower Garden*, published two years later. It is clearly most akin to *N. radiiflorus*, with which it has been commonly confused and of which it possesses the slender habit and star-like perianth; but it differs in the colouring of its shorter corona, and especially in its much broader, trigonous fruits. According to Sweet, Haworth thought it the *N. medio purpureus stellaris* of Parkinson, which it may well be, and it will be seen, on referring to the synonymy of *N. angustifolius* in the Monograph, that the *N. m. p. serotinus* Park. printed under *N. stellaris* is a clerical error for *N. m. p. stellaris*.

The *N. latifolius vi* of Clusius (Hist. Rar. Plant. *l. c.*) also seems from it "capitula triangula" to be identical with this plant rather than with *N. radiiflorus* Salisb., and if this be admitted,

N. stellaris is likewise the *N. niveus odoratus circulo rubello* C. Bauhin (*Pinax*, p. 48), and of Ray, and the *N. medio-purpureus minor* J. Bauhin (Hist. ii. 600).

N. stelliflorus Schur (Œsterr. Bot. Zeitsch. *l. c.*), a plant of Lower Austria like *N. latifolius vi* of Clusius, may similarly be identified with *N. stellaris*, which it closely resembles in description, while its author separates it from *N. radiiflorus* by its later flowering and obovate, angular fruits—points of distinction equally characterizing *N. stellaris*. The Transylvanian *N. seriorflorens* Schur is another plant not easily separable from *N. stellaris*, which indeed seems to be the most widely spread form throughout Austria. It is perhaps doubtful, in view of the many points of similarity between *N. stellaris* and *N. radiiflorus*, whether the two plants should be specifically separated, but in the present imperfect state of our knowledge I hesitate to unite them on account of the great difference in the fruits.

It will have been noticed that in Trans. Hort. Soc. i. 365, Salisbury states that his *N. radiiflorus* is a native of moist, subalpine meadows in Switzerland; and at the same time he cites for this species Redouté's figure of *N. poeticus*. The reasons for thus identifying the Swiss Narcissus are not given by Salisbury, but the habitat was copied by Haworth, both in the Revisio and the Monograph, and the Swiss plant has been generally referred to *N. radiiflorus* in subsequent works. The common Narcissus of Les Avants and other localities in Western Switzerland, however, is not only remarkable for its variable perianth, but it differs widely from *N. radiiflorus* in its flat, discoid corona and its broader, obscurely trigonous fruits. The flat corona similarly distinguishes it from *N. stellaris*, and at the same time it is clearly separable from *N. poeticus* L., which it resembles in the corona, owing to its subequal stamens with all the anthers more or less exserted. Its characters accord very fairly with those of Haworth's *N. majalis β exertus* (Narciss. Revisio, *l. c.*), which was described from a nursery plant, seen only in 1809, that may have readily died out in cultivation, as actually happens with the Swiss plant. At the time of describing this variety, Haworth thought it a very notable form, but afterwards in his Monograph it became simply var. γ of *N. poeticus*, characterized only by its exserted stamens, and illustrated by Redouté's figure, which Salisbury had referred to *N. radiiflorus*. The figure, although it depicts perianth-segments cuneately narrowed below as in *N. radiiflorus*, shows, to my eyes, a flat and not a cupular corona, and the form of its fruit is that of this Swiss plant or of *N. stellaris*. I therefore think that Salisbury erroneously referred this plate to *N. radiiflorus*, and as the plant drawn agrees in all respects with certain states of the Swiss Narcissus, it results that this latter can be identified with Haworth's *N. majalis* var. *exertus* of the Revisio and *N. poeticus* var. γ of the Monograph. The differences represented in Haworth's description and in this plate between the variety *exertus* and *N. majalis* Curt. are, however, much too essential for the plants to be held conspecific; and Haworth him-

self in the Revisio calls the variety a "forte propria species." Its subequal stamens resemble those of *N. radiiflorus* and *N. stellaris* rather than *N. majalis*, while its flat corona recalls *N. poeticus*, and taking its features as a whole, it seems almost as distinct as any of the forms hitherto dealt with as species. The only separate specific name that I can trace for this Swiss plant is *N. longipetalus* Schleicher in Steudel's *Nomenclator*—a "nomen nudum"; and Haworth's varietal name therefore becomes valid as *N. exertus* when it is raised to specific rank. It is probable that this plant is the *N. albus circulo croceo vel luteo* of the *Pinax*, which is said to differ from *N. albus circulo purpureo*, the flat-crowned *N. poeticus*, chiefly in the colour of the corona-margin.

In addition to these plants distinguished by Haworth, Herbert's variety *verbanensis*, which was unknown to his predecessor, merits notice as a form remarkable for its uniformly dwarf habit. Its unequal stamens resemble those of *N. poeticus* and *N. majalis*, and Parlatore appears to have included it with the former of these rather than with *N. radiiflorus*, as has been done by some more recent authors. But its different perianth-segments, more cuneate below and distinctly more acute, as well as its quite small cupular corona, render it difficult to place it as a variety under either *N. poeticus* or *N. majalis*, while it is still less like *N. recurvus*; and it thus seems necessary to treat it as a full species, *N. verbanensis*. It appears to be the prevalent Narcissus of the Italian Lakes district and is not improbably the *N. albus circulo croceo minor* of the *Pinax*. It is also possible that it is the *N. minimus medio purpureus* Park. Par. 87, No. 3, or the *N. medio croceus tenuifolius* Park. Par. 87, No. 2, which Haworth inserted in his genus *Helena* (Mon. p. 13) under the specific names of *purpureo-cincta* and *croceo-cincta* respectively. Of these two plants Haworth had no actual knowledge, but it is not easily explained why they were placed apart from the *poeticus* forms by Parkinson if they were really members of that group.

In the spring of 1914 I received from Savoy fresh flowers of a dwarf Narcissus with stamens as in *N. verbanensis* but with a more deeply cupped corona and narrower, more stellate perianth-segments similar to those of *N. stellaris*. This plant seems conspecific with Herbert's plant, though perhaps varietally distinct; and somewhat larger specimens in Herb. Kew, collected at Pontarlier in the French Jura and received from Gay under the name of *N. stellaris*, may also be identical, as likewise another plant there, from Aveyron, in Southern France, whence Herbert records *N. stellaris*. Unfortunately, the arrangement of the stamens in these exsiccata cannot be determined without dissecting the flowers, which is not practicable in a public collection; and it is therefore impossible to be certain whether these specimens are really referable to *N. verbanensis* or *N. stellaris*. But it is likely, seeing that *N. stellaris* is a more eastern form not otherwise known from France, that these plants are allied to the Narcissus of Savoy and *N. verbanensis*.

The next new forms published are those of Barr's List of 1884,

of which the most important is his "*poeticus* of Linnæus." This plant, of tall and robust habit but with extremely small flowers, appears to have derived its name from its identification with the specimen of the Linnean Herbarium, either by Barr or by Burbidge. But it has been shown that Linnæus's sheet of *N. poeticus* exhibits distinctly larger flowers, which the older authorities, Salisbury and Haworth, identified with *N. majalis* Curt., and from that species this pygmy-flowered form differs in several respects. I have, indeed, seen no examples with flowers only 1 in. broad, as stated by Barr, but the perianth of plants growing in Kew Gardens last spring barely exceeded 1½ in. and the diameter of finely grown flowers received from Mr. Engleheart was only ½ in. greater. Besides its remarkably small flowers as compared with its general habit, this plant is notable for its nearly cylindrical scape and its subglobose fruit, and in thickness of perianth it surpasses *N. recurvus*. Its stamens are unequal as in *N. poeticus*, while its relatively large corona recalls in colour that of *N. recurvus* though its form is broader and less clearly cupular. The combination of these peculiarities renders this Narcissus one of the most distinct of the group, deserving recognition as a species, and it is accordingly proposed to describe it as *N. hellenicus*. Its origin in cultivation is not certainly known and it cannot be traced in literature prior to 1884, but it has been reported to have been brought from Greece shortly before that year, and probably correctly so, for it seems identical with the Greek exsiccata represented both in Herb. Kew and Herb. Mus. Brit., "C. Haussknecht, Iter Græcum, 1885. *N. poeticus*. Agrapha, Neuropolis." A second example in Herb. Mus. Brit., "René du Parquet, Kalki, Sea of Marmora," may be a state of the same species, although of dwarfer habit and with a larger flower.

Another important plant introduced in Barr's List is his *ornatus*, which, as already shown, is not the species previously so named by Haworth. Barr's plant, now one of the best known of Narcissi, appears to be a wild form or old hybrid from Southern France which in characters is less closely allied to *N. poeticus* and *N. majalis* of that district than to the Swiss *N. exertus*. This is seen in its combination of flat corona and subequal stamens, as well as in its trigonous fruits, but the colouring and plication of its corona approximate in some degree to *N. majalis*. As a possibly wild plant it seems best placed in this paper as a variety of *N. exertus*, with which it most essentially agrees. As Haworth's name *N. ornatus* is reduced to a synonym of *N. poeticus*, the same epithet *ornatus* (Barr) may be held valid for a variety of the separate species *N. exertus*, with which it is proposed to associate Barr's plant. The general resemblance of this variety *ornatus* to Redouté's figure of *N. poeticus* may be easily seen.

Barr's further variety *grandiflorus*, which is still obtainable in Ireland, is a plant of unknown origin resembling *N. radiiflorus* but with larger flowers and a broader red margin to the corona.

I have not succeeded in obtaining fruit of this form, and it may be a hybrid which arose in cultivation in Holland.

The *stellaris* of Barr's List, remarkable for its inflated spathe, was perhaps a sport rather than a variety and was regarded as distinct from *N. stellaris* by Burbidge in 1889. It was on sale a few years ago as "*N. Marvel,*" but I have failed to obtain a fresh example of it.

Another distinct plant cultivated in recent years is *N. grandiflorus præcox*, an early-flowering form which recalls Haworth's description of *N. recurvus* var. *gracilior.* Its broad leaves and laterally inflexed perianth-segments resemble those of *N. recurvus*, as do also to some extent the stamens and corona; on the other hand, by its more stellate perianth, ellipsoid fruit and early flowering, it approaches *N. radiiflorus.* It is a form probably of Dutch origin, and perhaps a hybrid of these two species although normally they do not flower together.

A further form observed some years ago in a Dutch nursery and now much cultivated in England under the name of "Almira" seems more or less intermediate between *N. exertus* and the variety *ornatus.* Mr. Engleheart thinks it has the appearance of a wild plant, and if so, it was probably obtained by selection from some local race of *N. exertus*, of the type of which it may be considered an extreme form with remarkably broad and truncate perianth-segments and a deep red instead of orange margin to the corona.

Among the plants received last spring from Mr. Engleheart an extremely handsome, late-flowering form of Pyrenean origin, apparently referable to the flat-crowned *N. poeticus*, is worthy of mention on account of the breadth of its foliage (12–14 mm.) and the development of a well-marked, white zone in the corona of some of its flowers. It is possible, judging from this white zone, that it is a natural cross with some form of *N. majalis*, but without more local knowledge this cannot be satisfactorily determined.

The last variety to be noticed is *N. poeticus β sulphureus* Rouy (Fl. France, *l. c.*), distinguished solely by its sulphur-yellow flowers—a character that seems to indicate an accidental sport or a hybrid with some yellow-flowered species of *Narcissus.* I have seen no specimens of this variety.

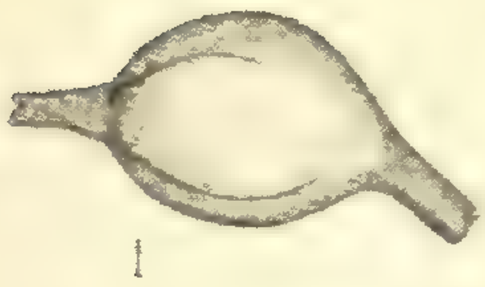
It will now be seen that of these varying forms of Poet's Narcissi, nine have been segregated for recognition as separate species. In grouping them the system of Haworth, based on the time of flowering, must be passed over as unscientific, for it plainly does not coincide with the plants' natural affinities and it is evident that the period when these plants bloom may depend largely on the latitude and altitude at which they grow. The two species recognised by Koch, *N. poeticus* and *N. radiiflorus*, seem to offer the basis of a better classification, for they are in some measure representative of two series of forms in which the other species may also be placed. But an arrangement of this kind is complicated by cross-affinities. *N. majalis* and *N. recurvus*,

which resemble *N. poeticus* somewhat in stamens and perianth, possess a cupular corona; *N. exertus* and *N. poetarum*, while agreeing with *N. radiiflorus* in their subequal stamens, have the flat corona of *N. poeticus*; and the differences in the fruits, moreover, are not correlated with those of any of the other organs. But there seems no more practical arrangement of these plants than the selection of Koch's two species, which are really widely different, as types of two series, *Eu-poetici* and *Radiiflori*, of which the unequal stamens, with imbricated perianth-segments, of *N. poeticus*, and the subequal stamens, with cuneate-based perianth-segments, of *N. radiiflorus* are regarded as the essential features. Each series is then readily subdivisible by its flat or cupular corona.

There is some evidence that this arrangement is not only practical but natural in the geographical distribution of these plants, for the first series, *Eu-poetici*, extends across Southern Europe from Spain through Southern France to Italy and Greece, while the second, *Radiiflori*, with the possible exception of *N. poetarum*, whose native country is unknown, favours more northern and eastern regions, ranging from Switzerland across Austria to Transylvania and the Balkans. In the Swiss Alps, where the habitats of the two series meet or overlap, we get the anomalous species *N. exertus* and *N. verbanensis* on the north and south sides of the main chain respectively, with *N. recurvus* in isolated spots in the Valais. *N. poeticus* L., in varying forms, appears widely spread from the Pyrenees to Southern Italy, while *N. majalis* seems to be local in the South of France, and the Greek *N. hellenicus* is a rare outlying species, showing marked peculiarities as might be expected. Among the *Radiiflori*, the late-flowering *N. stellaris* is probably generally distributed from the Tyrol to Transylvania, while the earlier *N. radiiflorus* seems to occur in the neighbourhood of the Adriatic, extending south-eastwards from Trieste to Servia and Montenegro.

This paper, which has been completed with some difficulty owing to pressure of other work, will be concluded with descriptions of such plants as appear to be essentially distinct and probably wild. My thanks are due to the Rev. G. H. Engleheart and Mr. P. R. Barr for supplying fresh material of a number of different forms, and to M. Beauverd, of the Boissier Herbarium, near Geneva, for living specimens and detailed information respecting the Alpine Narcissi. I am also indebted for valuable suggestions to Dr. O. Stapf.

As the work of early writers is of special interest in this genus a separate præ-Linnean synonymy will be given. Exsiccata will not be quoted owing to the general obliteration of floral characters and the doubt attaching to many sets that have been sent out. It may be suggested here that, in collecting these Narcissi, notes should be made of the form and colouring of the corona and the arrangement of the stamens. The shape of the fruit should also be added whenever possible. The following diagnoses have been drawn up from living plants, except where



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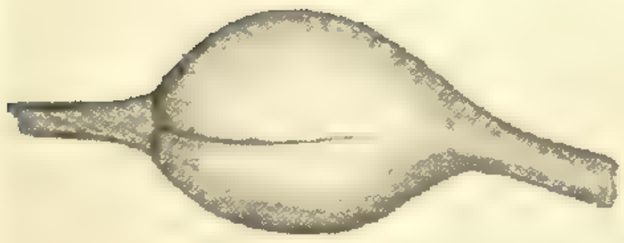

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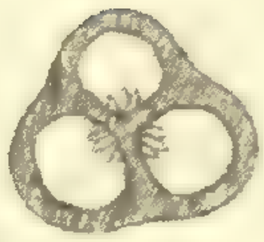

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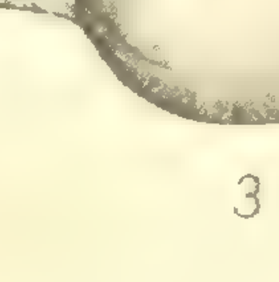

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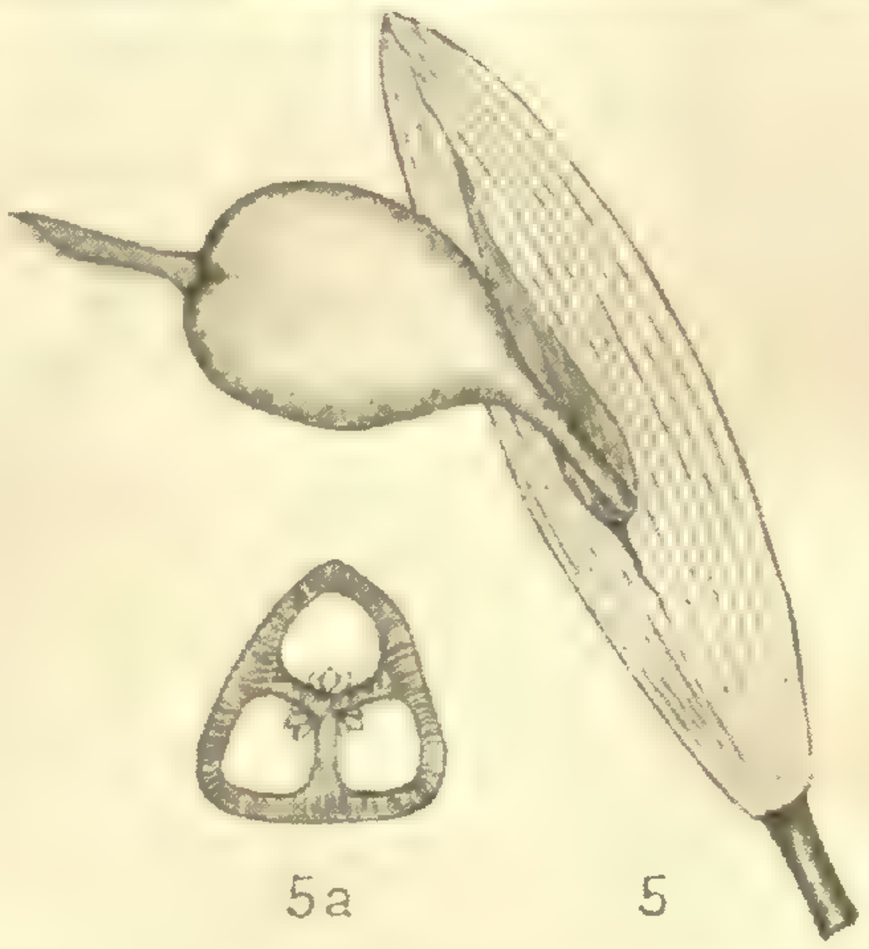

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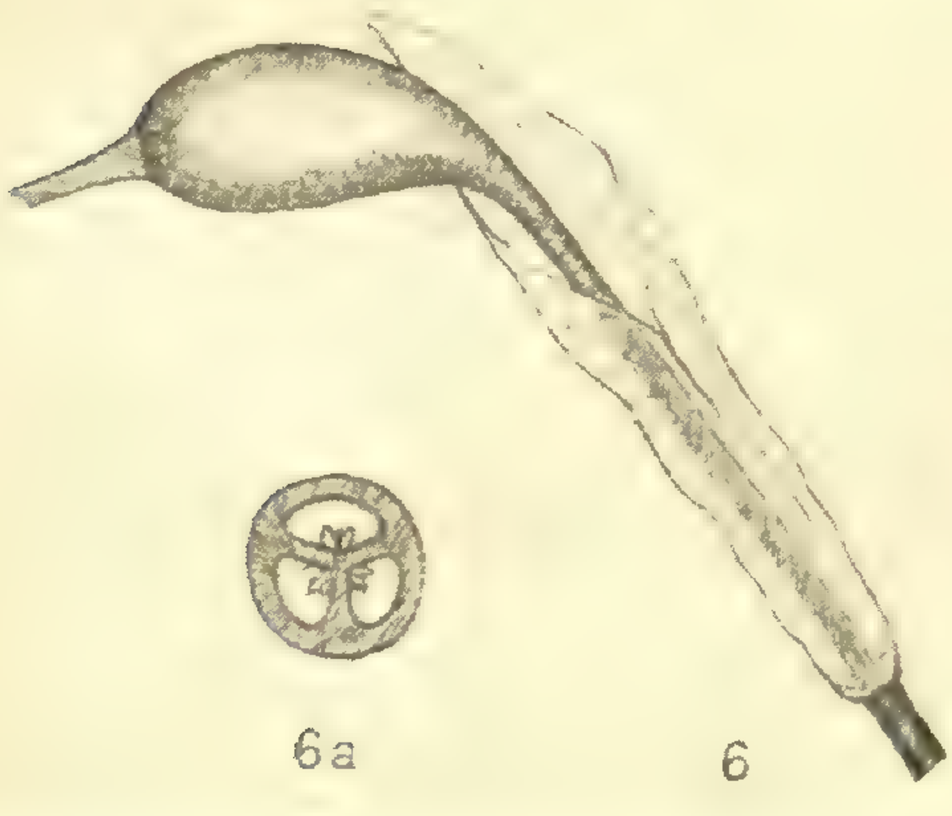

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FRUITS OF POET'S NARCISSI.

otherwise stated, and leading contrasting characters are italicised throughout. The form of the corona described is of that organ when fully expanded; at the opening of the flower it is, of course, plicate-cupular in every species. The positions of the stamens mentioned refer to their condition after the dehiscence of the anthers; before dehiscence the anthers are always longer and more exserted.

NARCISSUS L. Sp. Plant. 289 (1753).

Section Eu-Narcissus Baker Amaryll. 2 (1888).

Narcissus Haworth Mon. Narciss. 14, as a genus (1831); Herbert Amaryll. 80, as a genus (1837).

Spathe usually 1-flowered. Perianth-tube about as long as the white segments; corona several times shorter than these segments, discoid or cupular in form, yellow (except in *N. poetarum*) with a subscarious margin edged with red. Stamens more or less unequal (unequal or subequal), three long and three short alternating; filaments adnate to the perianth-tube; three or all of the anthers more or less exserted.

Conspectus of Species.

Series 1. Poetici. Stamens unequal; perianth-segments usually shortly narrowed and imbricate below.

* Corona flat and discoid at maturity.

1. *N. poeticus*. Fruit broadly ellipsoid, obscurely trigonous.

** Corona more or less cupular.

! Corona small; perianth-segments cuspidate.

2. *N. verbanensis*. Fruit ellipsoid; plant dwarf with small flowers.

!! Corona larger; perianth-segments more obtuse, mucronate.

3. *N. hellenicus*. Corona broadly cupular or saucer-shaped; fruit subglobose; plant robust with small flowers.
4. *N. recurvus*. Corona undulate-cupular; fruit large, subrotund-trilobate.
5. *N. majalis*. Corona cupular with flat base and white zone below red margin; fruit triangular-obovoid.

Series 2. Radiiflori. Stamens subequal; perianth-segments usually cuneately-narrowed below.

* Corona small, cupular.

6. *N. radiiflorus*. Corona distinctly cup-shaped; fruit linear-ellipsoid or pyriform, terete.
7. *N. stellaris*. Corona relatively broader; fruit ellipsoid, trigonous.

** Corona flat or nearly so, when mature.

8. *N. poetarum*. Corona sub-discoid, wholly red; fruit narrowly ellipsoid, nearly terete.
9. *N. exertus*. Corona flat and discoid; fruit ellipsoid or obovate-ellipsoid, more or less trigonous.

Series 1. Poetici.

1. Narcissus poeticus Linn.

True Poet's Narcissus.
Timely purple-ringed Daffodill of Gerard.
Early purple-ringed Daffodill of Parkinson.
Flat-crowned saffron-rim of Haworth.

Narcissus poeticus L. Spec. Plant. 289 (1753) non ejusdem herb.; Salisbury in Trans. Hort. Soc. i. 365 (1812); Haworth Narciss. Revis. 148 (1819); Koch Synop. Fl. Germ., ed. 2, 811 (1843); Parlatore Fl. Ital. iii. 116 (1858); Ascherson & Gräbner Synop. iii. 396, sensu lato (1906); Rouy Fl. Fr. xiii. 53, sensu lato (1912); *N. tripodalis* Salisb. MS.; *N. ornatus* Haworth Mon. Narciss. 14 (1831).

N. poeticus mediocroceus purpureus Lobel Stirp. Adv. Nov. 50 (1570); *N. medio purpureus præcox* Gerard Herb. 108 (1597); *N. latifolius alter* Clusius Hist. Rar. Pl. ii. 156 (1601); *N. albus circulo purpureo* C. Bauhin Pin. 48 (1623); *N. medio purpureus præcox* Park. Par. 76 et 75, f. 3 (1629).

Icon.—Nost. tab. fig. 1 and 2.

Bulb ovoid or ovoid-elongate, 25–30 mm. in. diameter when cultivated, smaller wild, outer scales pale brown with fine, darker veins. Leaves erect, shorter than the scape, 6–9 mm. broad, green or glaucescent, distinctly keeled and channelled. Scape 30–40 cm. long, compressed and 2-edged, striate, moderately stout but sometimes attenuate above. Spathe more or less thickly membranous, sometimes rather long; pedicel rather slender. Flower scented, 5·5–7 cm. in diameter, with rather slender, light green tube and snow-white perianth tinged with yellow at the base; *perianth-segments imbricate below*, often twisted, the *outer oblong-obovate*, truncate and mucronate, little narrowed below and *reflexed*, the *inner* shorter and narrower, *oval-oblong*, subacute or mucronulate, horizontally *spreading*. *Corona flat and discoid* when developed, 13–15 mm. broad, yellow with a greenish centre and a moderately broad red or orange-red edge, within which a narrow whitish zone sometimes appears as the flower fades, much plicate-rugose in the outer half with plicate-crenulate-dentate margin. *Stamens unequal*; three anthers exserted, three included in the perianth-tube; style sometimes included, sometimes equalling or slightly exceeding the longer stamens. *Fruit* about 15 mm. long, *broadly ellipsoid*, *obscurely trigonous* with 3 faint furrows.

Pyrenean forms sometimes show longer and thicker spathes, narrower perianth-segments and a greater development of the red colouring in the corona.

The type of *N. poeticus*, which flowers naturally in March or early April, has been known since the time of Lobel and Clusius as the early-flowering Poet's Narcissus of the South of France, and was recorded by Magnolius as growing near Montpelier in company with the late-flowering *N. majalis*. It is also a native

of Italy, and of the Pyrenees, where it does not flower till May; and it is probably the species of this group stated by Willkomm and Lange to inhabit Central and Eastern Spain. It is further recorded by Ascherson and Gräbner for South Tyrol, although its occurrence as an indigenous plant east of the Alps would not be expected.

As a British garden plant, blooming in April, *N. poeticus* is known to have been continuously cultivated since the days of Gerard. It was a familiar plant in the seventeenth century, and as late as 1833 was commonly grown for the London flower market. It has become scarce in England during the last forty years apparently owing to its general supersession by *N. exertus* var. *ornatus*.

2. Narcissus verbanensis, nov. comb.

Narcissus verbanensis nov. comb.; *N. poeticus* var. *verbanensis* Herbert Amaryll. 317 (1837); *N. poeticus* subsp. *radiiflorus* f. *verbanensis* Baker Amaryll. 12 (1888); *N. poeticus* subsp. *angustifolius* var. *verbanensis* Ascherson and Gräbner Synop. iii. 397 (1906).

N. albus circulo croceo minor C. Bauhin Pinax, 49 (1623)?

Icon.—Herbert, *l. c.*, tab. 37, fig. 2, as *N. poeticus* var. *verbanensis* (mala).

Plant dwarf. Bulb ovoid, very small, 12–15 mm. in diameter. *Leaves narrow* and erect, shorter than the scape, only 3–5 mm. broad, keeled and channelled. *Scape* 20–30 cm. long, finely striate, *very slender.* Spathe thinly membranous, of moderate length; pedicel very slender, usually short. *Flower* scented, *small*, 3·5–4·5 cm. in diameter, with moderate green tube and snow-white perianth tinged with yellow or greenish at the base; *perianth-segments imbricate or distinct*, varying in shape from *elliptical to oblong*, rather shortly narrowed below, more or less strongly mucronate or *cuspidate*, *spreading or recurved. Corona shortly cupular*, *small*, 8-9 mm. broad and 2 mm. deep, yellow edged with red, margin finely plicate-crenulate-dentate. *Stamens unequal*; three anthers exserted, three included in the perianth-tube; style rarely exceeding the longer stamens. *Fruit* about 12 mm. long, *ellipsoid*, doubtfully trigonous and furrowed.

Description from exsiccata collected at Baveno, the *locus classicus.*

N. verbanensis flowers in the latter half of May, and in its typical form is widely distributed in the Italian Lakes district. In Savoy and the Mont Cenis district, and possibly elsewhere in France, a different form occurs, perhaps varietally distinct, in which the spathe is longer, the perianth-segments much narrower, acute, oblanceolate and distant below, and the corona more deeply cupular.

It is apparently only in recent years that this graceful plant has been brought into British gardens, where most cultivators have found it a very short-lived tenant.

3. Narcissus hellenicus, nov. spec.

Narcissus hellenicus, nov. spec. *N.* "*poeticus* of Linnæus" ap. Barr in Fl. and Pomol., 101 (1884) et hort.

Bulbus ovoideus vel ovoideo-elongatus, in hortis 25--30 mm. in diametro, tunicis exterioribus fusco-tinctis præditus. *Folia haud angusta*, erecta, scapo fere æqualia, 10–12½ mm. lata, alte viridia, carinâ obscurâ complanata. *Scapus* 30–45 cm. longus, *subcylindricus*, vix anceps, grosse striatus, crassus, spathâ dense membranaceâ pedicelloque crassiusculo præditus. *Flores parvi*, odorati, 3·5–4·75 cm. in diametro, tubo lato cylindrico alte viridi et perianthio niveo basi vix luteo-tincto præditi; *perianthii segmentis* crassis, *imbricatissimis*, *orbicilari-obovatis*, interioribus rotundo-obtusis, exterioribus mucronatis paululum latioribus, omnibus *patentibus* et subirregulariter undatis vel margine paulum inflexo planis. *Corona subcupularis vel* marginibus e medio lato plano ascendentibus *pateræformis*, *relative magna*, circa 13 mm. lata, medio viridi marginibusque haud angustis coccineis infra quos circulus angustus albidus denique explicatus est pallide flava, irregulariter et sparse in dimidio exteriore plicato-rugosa, margine plicato-crenulato prædita. *Stamina inæqualia*, antheris tribus paulo exsertis, tribus in perianthii tubo inclusis; stylus stamina longiora fere æquans. *Fructus* circa 16 mm. longus, *subglobosus*, haud triangularis, vix sulcatus.

Habitat, ut videtur, in regione Montis Pindi Græciæ borealis.

Bulb ovoid or ovoid-elongate, 25–30 mm. in diameter when cultivated, tinted with deep brown. *Leaves broad* and erect, nearly equalling the scape, 10–12½ mm. broad, dark green, flattened and obscurely keeled and channelled. *Scape* 30–45 cm. long, *subcylindrical* and scarcely 2-edged, ribbed, stout. Spathe thickly membranous; pedicel rather stout. *Flower small*, scented, 3·5–4·75 cm. in diameter, with broad, cylindrical, deep-green tube and snow-white perianth very slightly tinged with yellow at the base; *perianth-segments* thick, *much imbricated*, *orbicular-obovate*, the inner rounded-obtuse, the outer rather broader and mucronate, all *spreading* and either a little irregularly waved or nearly flat with slightly inflexed margins. *Corona* subcupular or *saucer-shaped* with margins ascending from a broad, flat centre, *relatively large*, about 13 mm. broad, pale yellow with a green centre and a moderate edge of crimson, below which a faint and narrow white zone finally develops, irregularly and rather distantly plicate-rugose in the outer half with plicate-crenulate margin. *Stamens unequal*, with three anthers slightly exserted and three included; style nearly equalling the longer stamens. *Fruit* about 16 mm. long, *subglobose*, *not trigonous* and scarcely furrowed.

This plant, remarkable for its combination of a robust habit with small but finely formed flowers, does not appear to have been known until recent years in horticulture, and it has not hitherto been botanically described. It is reasonably certain that it is indigenous in the region of Mt. Pindus, in Northern Greece,

and it may be the form recorded by Boissier and Halacsy for Mt. Œta and for Bœotia, the home of the Narcissus of classical legend.

It flowers during May in English gardens and about a month later in the mountains of Greece.

4. Narcissus recurvus Haworth.

Drooping-leaved saffron-rim of Haworth.

Old Pheasant's Eye Narcissus auct. recent. et hort.

Narcissus recurvus Haworth Syn. Pl. Succ. App. 331 (1812); Narciss. Revis. 151 (1819); Mon. Narciss. 15 (1831); Sweet Brit. Fl. Garden, No. 188 (1833); *N. curvilobus* Salisb. MS.

Icon.—Sweet, *l. c.* No. 188.

Bulb large, subrotund-ovoid, 30–35 mm. in diameter when cultivated but smaller when wild, outer scales pale brown with fine, darker veins. *Leaves large, recurved and drooping* in upper quarter, about as long as the scape, 10–13 mm. broad, glaucous, obscurely keeled and channelled in lower half and nearly flat above. Scape 30–45 cm. long, 2-edged but little compressed, strongly striate, rather stout. Spathe moderately long and thick; pedicel stout, almost equalling the uppermost part of the scape. Flower scented, 6–6·5 cm. in diameter, with rather broad, slightly flattened, deep green tube and snow-white perianth, of unusually constant form, slightly greenish at the very base; *perianth-segments* thick, shortly narrowed and *imbricate below*, the *outer oval, truncate or retuse*, mucronate, the *inner ovate-oblong, obtuse*, mucronate, all rigidly *arcuate-recurved with laterally inflexed margins*. *Corona undulate-cupular* with margins ascending from a rather narrow centre, *rather large*, 12–14 mm. broad and 3–3·5 mm. deep, green in the central half and chrome-yellow beyond, with a rather broad edge of deep red, within which a whitish zone may rarely appear after maturity, much plicate-rugose with irregularly plicate-crenulate-dentate margin. *Stamens very unequal*, with three anthers slightly exserted and three distinctly falling short of the perianth-tube; anthers shorter and relatively broader than in the other species of the section, with paler coloured pollen. Style included or very shortly exserted, sometimes equalling the shorter stamens, sometimes almost as long as the longer ones. *Fruit large*, nearly 20 mm. long, more or less irregularly *subrotund-trilobate*, with three deep furrows.

β gracilior Haworth Mon. Narciss. 15 (1831).

Leaves much *narrower* than in the type, glaucescent, less flat, a *few* only *recurved*, the others generally as tall as the slenderer scape; red margin of the corona often narrow.

The description of the variety *gracilior* has been adopted from Haworth.

N. recurvus, which has not hitherto been reported as a wild plant, has the appearance of indigenity in a few localities (alt. 4–6000 ft.) in the Valais of Switzerland, where it flowers early in June. Its origin in cultivation is not certainly known, but it seems to have been a rare plant introduced about the beginning

of the nineteenth century into British Nurseries, in which it must have very rapidly increased, as might indeed be expected from its vigorous habit of growth. It flowers abundantly in our gardens about the middle of May, but does not respond to forcing or pot-culture. Its very purely coloured and fantastically symmetrical flowers are perhaps more beautiful than those of any other wild Poet's Narcissus.

5. Narcissus majalis Curtis.

Late purple-ringed Daffodill of Parkinson.
Middle-sized May-flowering Narcissus of Haworth.

Narcissus majalis Curtis Bot. Mag. sub. t. 193 (1793); Haworth Narciss. Revis. 150, excl. syn. (1819); *N. patellaris* Haworth Syn. Pl. Succ. App. 331 (1812) non Salisbury; *N. poeticus* Linn. Herb., et L. ap. Haworth Mon. Narciss. 15, excl. var. γ (1831).

N. medio purpureus serotinus Park. Par. 76 (1629); *N. medio purpureus* J. Bauhin Hist. Pl. ii. 600, cum icone (1651); Ray Hist. ii. 1133, **ex parte** (1688).

Bulb ovoid or ovoid-elongate, 25–30 mm. in diameter when cultivated, smaller wild, outer scales pale brown with darker veins. *Leaves erect*, shorter than the scape, *7–9 mm. broad*, glaucescent, obscurely keeled and channelled. *Scape 25–40 cm. long*, 2-edged and much compressed, striate, rather stout. Spathe of moderate size and thickness; pedicel flattened, rather stout. Flower scented, 5·5–7 cm. in diameter, with rather broad, slightly flattened, deep green tube and snow-white perianth tinged with yellow at the base; *perianth-segments* rather thick, *imbricate below* with irregularly waved or recurved margins, the *outer obovate-oblong*, rounded-obtuse, mucronate and *slightly recurved*, the *inner oval or oblong*, rounded-obtuse or subacute, *spreading*. *Corona shortly cupular* with margins suberect from a broad, flat base, *rather large*, 12–14 mm. broad and about 3 mm. deep, chrome-yellow with a green base and above a *narrow, clear white zone within the rather narrow crimson edge*, finely and closely plicate-rugose beyond the flat base with finely plicate-crenulate-dentate margin. *Stamens unequal*, three anthers slightly exserted, three included in the perianth-tube; style equalling the longer stamens. *Fruit* about 15 mm. long, *triangular-obovoid*, scarcely furrowed.

β **patellaris, nov. comb.**
Purple-circled Daffodill of Gerard.
Great white purple-ringed Daffodill of Parkinson.
Large, broad, May-flowering Narcissus of Haworth.

N. patellaris Salisb. Prod. 225 (1796); Haworth Mon. Narciss. 15 (1831); *N. poeticus* Smith Eng. Bot. 275 (1795).

N. medio purpureus Gerard Herb. 108, cum icone (1597); *N. latifolius vii* Clusius Hist. Rar. Pl. ii. 157 (1601); *N. albus magno odore flore circulo pallido* C. Bauhin Pin. 48 (1623); *N. medio purpureus maximus* Park. Par. 76 et 75, fig. 2 (1629); *N.*

medio-purpureus magno flore ; folio latiore J. Bauhin Hist. Pl. ii. 600 (1651) ; *N. medio purpureus magno flore latiore* Ray Hist. ii. 1133 (1688).

Icones.—Eng. Bot. 275, as *N. poeticus* ; Nost. tab. fig. 6–9.

Leaves nearly as long as the scape, *9–13 mm. broad*, glaucous, keeled and channelled almost throughout. *Scape 40–50 cm. long*, finely striate, slender and attenuate upwards. Spathe rather larger and thicker than in the type; pedicel slender. Perianth-segments sometimes broader than in the type, with more regularly reflexed margins. *Corona* a little more deeply cupular than in the type, *with a rather broad white zone below the moderately broad, light red edge*, finely but irregularly plicate-rugose above the flat base with finely plicate-denticulate-*fimbriate* margin. Style equalling or barely exceeding the shorter stamens. Otherwise as in the type.

Of *N. majalis* in a wild state very little is positively known, but, judging from herbarium material, it appears to be the late-flowering Poet's Narcissus regarded as a native of Montpelier, in S. France, since the time of Magnolius. It also occurs, of doubtful nativity, at Champigné, Dép. Maine-et-Loire (Boreau, 1852, in Herb. Kew), and perhaps in other French localities. A western European origin is attributed to it by Parkinson.

The variety *patellaris*—a larger plant with flowers often of similar size—was thought by Clusius to have come from Styria, and Salisbury, possibly from independent information, also states that it grows wild in the Alps of Styria and Kartschia. On the other hand, Parkinson refers to it as obtained from Constantinople. As no wild specimen has been traced in herbaria, its origin remains uncertain, but it would appear probable on general grounds that, like the specific type, it came from Western Europe. A not unlikely habitat is the Pyrenees.

As garden plants both type and variety have been very long in cultivation in Britain and on the Continent. Johann Bauhin noticed the type in gardens at Bâle, and refers to it as growing also in Belgium, Germany and England. The var. *patellaris* was observed by Clusius at Frankfort, and is the *N. medio purpureus* of Gerard, apparently the best known Poet's Narcissus of the English gardens of his day. Gerard's name, however, may have included the specific type as well as the variety, for Parkinson shows that both of them were grown with us at a little later date. Further evidence of the former frequency of the var. *patellaris* is afforded by its escape and naturalization in Kent and other localities towards the close of the eighteenth century, which led to its inclusion as a British plant in *English Botany* and other subsequent floras. It is only during the last twenty years that the species has become scarce in English gardens, and the var. *patellaris* is no longer easily obtainable.

N. majalis flowers in our gardens in May, a little before the var. *patellaris*, which is almost the last member of the group to come into bloom.

Series 2. Radiiflori.

6. Narcissus radiiflorus Salisbury.

Narrow-leaved saffron-rim of Haworth.

Narcissus radiiflorus Salisb. Prod. 225 (1796), et Trans. Hort. Soc. i. 365, excl. syn. (1812); Haworth Narciss. Revis. 149 (1819); Koch Synopsis, ed. 2, 811 (1843); Parlatore Fl. Ital. iii. 118 (1858); *N. angustifolius* Haworth Mon. Narciss. 14 (1831); *N. poeticus* subsp. *radiiflorus* Baker Amaryll. 12 (1888); *N. poeticus* subsp. *angustifolius* Ascherson & Gräbner Synopsis, iii. 397, sensu lato (1906); *N. poeticus* race *N. radiiflorus* Rouy Fl. Fr. xiii. 54, sensu lato (1912).

N. medio purpureus præcocissimus Gerard Herb. 108, cum icone (1597)?

Icones.—Curtis Bot. Mag. 193, as *N. angustifolius* (nomen confusum); Nost. tab. fig. 3–5.

Bulb ovoid, rather small, about 25 mm. in diameter (cult.), outer scales whitish-brown, with well-marked, darker veins. Leaves erect, nearly equalling the scape, 5–8 mm. broad, green or glaucescent, keeled and slightly channelled. Scape 30–40 cm. long, compressed and 2-edged, striate, slender. Spathe thinly membranous; pedicel slender, sometimes elongate. Flowers strongly scented, 6–7 cm. in diameter, with slender, light green tube and *stellate, greenish-white perianth* tinged with yellow at the base; *perianth-segments cuneately narrowed below, not imbricate*, the *outer oblanceolate*, cuspidate or mucronate, the *inner more elliptical*, acute or subacute, all *spreading* or slightly waved. *Corona cupular*, suberect from a narrow base, *small*, 8–10 mm. broad and 2–2½ mm. deep, bright yellow edged, sometimes broadly, with deep red, plicate-rugose with unevenly but closely plicate-crenulate-dentate margin. *Stamens subequal;* anthers all exserted from the perianth-tube, the upper nearly reaching the edge of the corona (exceeding it before dehiscence). Style variable, sometimes slightly exceeding the longer, sometimes only equalling the shorter stamens. *Fruit* about 18 mm. long, *linear-ellipsoid* or narrowly pyriform, *terete*, not trigonous or furrowed.

N. radiiflorus seems to have been first clearly distinguished as a wild plant by Koch, who records it for the neighbourhood of Trieste and other Austrian localities, as well as the Swiss Valais. Its occurrence in the latter province, however, may be doubted, for Jaccard (Cat. Fl. Valaisanne, 1895) notes it only for the extreme west of the Valais, where *N. exertus* has apparently been mistaken for it. It seems to inhabit also Servia and Montenegro, and probably Bosnia, but the more northern Austrian habitats where it has been recorded should probably be referred to *N. stellaris*, with which it has been very generally confused.

As a garden plant, *N. radiiflorus* may possibly be the *N. medio purpureus præcocissimus* of Gerard, but was unknown to Parkinson and Ray. It was evidently noticed in cultivation by Curtis, and was familiar to Salisbury and Haworth, since whose time it has been regularly grown in English gardens till in quite recent years

it has given place, like *N. poeticus*, to *N. exertus* var. *ornatus* and other newer forms.

Both in its native habitats and in British gardens it flowers in April, and its stellate, greenish-white flowers are so distinct from those of the other cultivated Poet's Narcissi that it certainly should not be entirely banished from our gardens. It is said to be one of the species from which early flowers are obtainable by forcing.

7. Narcissus stellaris Haworth.

Starry purple-ringed Daffodill of Parkinson.
Long-petalled saffron-rim of Haworth.

Narcissus stellaris Haworth Mon. Narciss. 15 (1831); Sweet Brit. Fl. Garden, No. 132 (1833); *N. seriorflorens* Schur Pl. Transs. 657 (1866)?; *N. stelliflorus* Schur in Œsterr. Bot. Zeitsch. xix. 205 (1869); *N. radiiflorus* auct. mult. non Salisb. Prod.

N. latifolius vi Clusius Hist. Rar. Pl. ii. 156 (1601); *N. niveus odoratus circulo rubello* C. Bauhin Pin. 48 (1623), et Ray Hist. ii. 1133 (1688); *N. medio purpureus stellaris* Park. Par. 76 et 75, f. 4 (1629); *N. medio-purpureus minor* J. Bauhin Hist. Pl. ii. 600, cum icone (1651).

Icon.—Sweet, *l. c.*, No. 132.

Bulb ovoid, rather small. Leaves erect, shorter than the scape, 6–8 mm. broad, green or glaucous, keeled and channelled. Scape 30–40 cm. long, 2-edged and slightly compressed, striate, rather slender and attenuate above. Spathe thinly membranous, rather short; pedicel slender. Flower scented, 5·5–6·5 cm. in diameter, or perhaps sometimes larger, with light green tube and *stellate, greenish-white perianth; perianth-segments cuneately narrowed below, distant* throughout and *not imbricate*, the *outer cuneate-obovate*, the *inner oblanceolate*, all acute or sharply mucronate, *spreading*, sometimes undulate or twisted. *Corona shortly cupular, rather small*, about 10 mm. broad and 2 mm. deep, yellow *with* a very *narrow white zone* within the narrow scarlet-red edge, margin finely plicate-crenulate. *Stamens subequal*, with all the anthers more or less exserted. Style not exceeding stamens. *Fruit* about 15 mm. long, *shortly ellipsoid* or obovoid, *trigonous* and furrowed.

Description adopted chiefly from Haworth and Sweet.

This species, first distinguished by Clusius, is widely distributed in the mountainous regions of Austria from the Tyrol to Transylvania, in which province what appears to be a form of it has been described under the name of *N. seriorflorens* Schur. It may also occur in the Balkan Peninsula.

Although known to Parkinson and Haworth, it does not seem to have been extensively grown at any period in English gardens, possibly because it does not readily flourish under cultivation. It is a late-flowering plant, never blooming before May, and often during June in its natural stations.

8. Narcissus poetarum Haworth.

Saffron-cupped Narcissus of Haworth.

Narcissus poetarum Haworth Mon. Narciss. 14 (1831); *N. poeticus* var. *grandiflorus* Sabine MS. ap. Herbert Amaryll. 317 (1837); *N. poeticus* var. *poetarum* Burbidge & Baker Narciss. 85 (1875).

Bulb ovoid, rather small, about 25 mm. in diameter, outer scales greyish-brown with strongly marked dark veins. *Leaves erect or* sometimes *with drooping tips*, nearly equalling the scape, 8–11 mm. broad, rather glaucous, channelled and slightly keeled. Scape 30–50 cm. long, little compressed, obscurely striate, slender. *Spathe* rather thickly membranous, narrow and *very long* (equalling or exceeding 7 cm.); pedicel slender, elongate. Flower strongly scented, about 7 cm. in diameter, with relatively short, scarcely flattened, green tube and snow-white perianth; *perianth-segments not imbricate*, much narrowed and scarcely contiguous below, *elliptic-obovate*, subacute and sometimes mucronate, all *spreading* and more or less irregularly undulate. *Corona subdiscoid*, about 13 mm. broad, deep yellow *suffused* throughout *with bright red*, but soon becoming paler, strongly and irregularly plicate-rugose with plicate-crenulate-dentate margin. *Stamens subequal*, with all the anthers more or less exserted; style exserted, a little exceeding the longer stamens. *Fruit* 15–18 mm. long, *narrowly ellipsoid*, scarcely trigonous or furrowed.

This distinct and beautiful Narcissus, which flowers in English gardens during April, is not known as a wild plant and was first brought to notice by Haworth in 1831. As an early-flowering member of the series *Radiiflori* it may be suspected to have originated in South-eastern Europe.

9. Narcissus exertus, nov. comb.

Middle flowering Narcissus of Haworth.

Narcissus exertus nov. comb.; *N. majalis β exertus* Haworth Narciss. Revis. 150 (1819); *N. poeticus* var. γ Haworth Mon. Narciss. 15 (1831); *N. longipetalus* Schleicher in Steudel Nomenclator (nomen nudum); *N. radiiflorus* auct. nonnull. non Salisb. Prod.

N. albus circulo croceo vel luteo C. Bauhin Pin. 49 (1623)?; *N. medio croceus serotinus* Park. Par. 74 (1629)?; *N. uniflorus foliis ensiformibus scypho brevissimo* Haller Hist. n. 1250 (1768).

Icon.—Redouté *Liliaceæ*, iii. 160, as *N. poeticus*.

Bulb ovoid, small, 20–25 mm. in diameter (wild), outer scales pale brown. Leaves erect, rather shorter than the scape, 6-9 mm. broad, green or glaucescent, folded below but becoming flattened above, obscurely keeled. *Scape* 30–40 cm. long, compressed and 2-edged, striate, *very slender*. Spathe thinly membranous; pedicel very slender, of variable length. Flower scented, 5–6·5 cm. in diameter, with slender, pale green tube and snow-white *perianth of variable form*, tinged with yellow at the base; *perianth-segments*

cuneate-based or less commonly shortly narrowed and *imbricate below*, often twisted and usually not contiguous, *lanceolate, elliptic, oval or obovate*, more or less acute or the outer sometimes obtuse and mucronate, *spreading, recurved or irregularly undulate. Corona flat and discoid*, or rarely slightly convex, 12–13 mm. broad, chrome-yellow or slightly green about the centre, edged, at times rather broadly, with orange-red or orange (with no white zone), faintly plicate-rugose with irregularly and often obscurely plicate-crenulate-dentate margin. *Stamens subequal*; anthers all exserted, the three lower just emerging from the perianth-tube. Style of variable length, sometimes equalling the shorter stamens, sometimes exceeding the longer ones. *Fruit* about 15 mm. long, *ellipsoid, somewhat trigonous* and furrowed.

β ORNATUS, NOV. VAR.

N. poeticus var. *ornatus* Barr in Fl. et Pomol. 101 (1884) et hort., non *N. ornatus* Haworth.

Bulbus ovoideus, 25–30 mm. in diametro. Folia erecta, scapo paululum breviora, 8–10 mm. lata, glaucescentia, inferne plicata sed apicem versus complanata, obscure carinata. Scapus 30–45 cm. longus, anceps, tenue striatus, gracilis, spathâ modice membranaceâ pedicelloque gracillimo prædítus. Flores odorati, 5·5–6·5 cm. in diametro, *perianthii* tubo gracili pallido et *segmentis* niveis (basi luteo-tinctis) sæpissime *obovatis*, rotundato-obtusis vel exterioribus quæ paulo latiora sunt truncato-mucronatis, omnibus *infra angustatis* basin versus vix imbricatis, *patentibus* fere planisque vel interioribus undulatis, *rarius* omnibus *recurvatis*. *Corona subdiscoidea* 10–13 mm. lata, lutea orâ angustâ coccineâ intra quam *circulus perangustus albus* explicatur circumscripta, margine tenuiter plicato-crenulato-serrato obscure plicato-rugosa. *Stamina subæqualia*, antheris omnibus plus minusve exsertis. Stylus vix exsertus, staminibus haud longior. *Fructus* circa 18 mm. longus, *obovato-ellipsoideus, obtuse trigonus*, sulcatus.

Planta originis incertæ, probabiliter e Galliâ Narbonensi ablata, et fortasse inter *N. exertum* et *N. majalem* hybrida.

Bulb larger than in the type, 25–30 mm. in diameter. Leaves also slightly larger, glaucescent. Scape 30–45 cm. long, finely striate, slender, but less so than in the type; spathe moderately thick. Flower 5·5–6·5 cm. in diameter; *outer perianth-segments* more or less *broadly obovate*, retuse-mucronate, *inner* ones rather narrower, *elliptic-obovate*, rounded-obtuse, *all* usually *cuneate-based* and scarcely imbricate below, *spreading* and nearly flat or the inner waved, *more rarely* all *recurved*. *Corona sub-discoid* and nearly flat, 10–13 mm. broad, chrome-yellow with a narrow, scarlet-red edge and, at maturity, a *very narrow white ring* within it; obscurely plicate-rugose with finely plicate-crenulate-serrate margin. Style just exserted from the perianth-tube, not exceeding the stamens. *Fruit* larger than in the type, about 18 mm. long, *obovate-ellipsoid, bluntly trigonous*, furrowed. Otherwise as in the type.

N. exertus, a May-flowering species perhaps confined to Switzerland, appears to have been distinguished by Caspar Bauhin and by

Haller but has been commonly identified during the past century with *N. radiiflorus*.

Parkinson seems to have been acquainted with it as a rare garden plant and Haworth described it from a London nursery, but there is no evidence of its having been at any time commonly cultivated in Britain.

The variety *ornatus*, introduced into cultivation from the South of France through the Paris firm of Vilmorin about the year 1870, is now one of the most abundant of garden Narcissi in Western Europe. Its precise origin is not known, but it may be suspected from the colouring and fine plication of its corona, as well as the form of its fruit, to be a hybrid of *N. exertus* with *N. majalis*. Such a parentage, however, is rendered doubtful by its flowering in April instead of May, and the facility with which it may be forced into bloom still earlier. It has hitherto been regarded solely as a garden plant, but as it is believed to have been originally collected and probably a wild form, it cannot well be excluded from an arrangement of the forms of *Eu-Narcissus*.

Explanation of Floral Plate.

(Reproduced from original drawings by R. A. Salisbury now preserved in Herb. Mus. Brit.)

Figs. 1 and 2.—Flowers of *Narcissus poeticus* L. (labelled *tripodalis*).
Fig. 3.—Flower of *N. radiiflorus* Salisbury.
Fig. 4.—Corona of *N. radiiflorus*, with six exserted anthers before dehiscence.
Fig. 5.—Opened corona and perianth-tube of *N. radiiflorus*, showing subequal stamens.
Fig. 6.—Mature flower of *N. patellaris* Salisbury, showing anthers after dehiscence.
Fig. 7.—Younger flower of *N. patellaris*, showing anthers before dehiscence.
Fig. 8.—Corona of *N. patellaris*, with three exserted anthers.
Fig. 9.—Opened corona and perianth-tube of *N. patellaris*, showing unequal stamens.

Explanation of Plate showing Fruits.

(All developed in water.)

Figs. 1 and 1*a*.—Fruit of cultivated *Narcissus poeticus*, with transverse section.
Figs. 2 and 2*a*.— ,, ,, Pyrenean ,, ,, ,, ,, ,,
Figs. 3 and 3*a*.— ,, ,, *N. hellenicus*, with transverse section.
Figs. 4 and 4*a*.— ,, ,, *N. recurvus*, ,, ,, ,,
Figs. 5 and 5*a*.— ,, ,, *N. majalis* var. *patellaris*, with transverse section, and showing thickly membranous spathe.
Figs. 6 and 6*a*.— ,, ,, *N. radiiflorus*, with transverse section, and showing thinly membranous spathe.
Figs. 7 and 7*a*.— ,, ,, *N. exertus* var. *ornatus*, with transverse section.

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CORRIGENDA.

P. 13, last line, *dele* "Spreng."
P. 25, l. 5 from top, for "the conifer *Callitris*" read "*Casuarina*."
P. 31, l. 16 from top, for "*Callitris*" read "*Casuarina*."
P. 72, l. 1, for "Honiton" read "Torquay."
P. 200, l. 26 from bottom. The "undescribed species" = *Zexmenia columbiana* Blake (see p. 306).
P. 255, l. 6 from top, for "Washington" read "Darlington."
P. 308, l. 8 from top, for "Devon" read "Dorset."
P. 335, l. 9 from bottom, after "arbitrary" add "in many cases": l. 17 for "(*a*)" read "(*b*)."
P. 337, l. 16 from top, add "excl. var. *latifolius*.'

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